OCT 1 5 1928

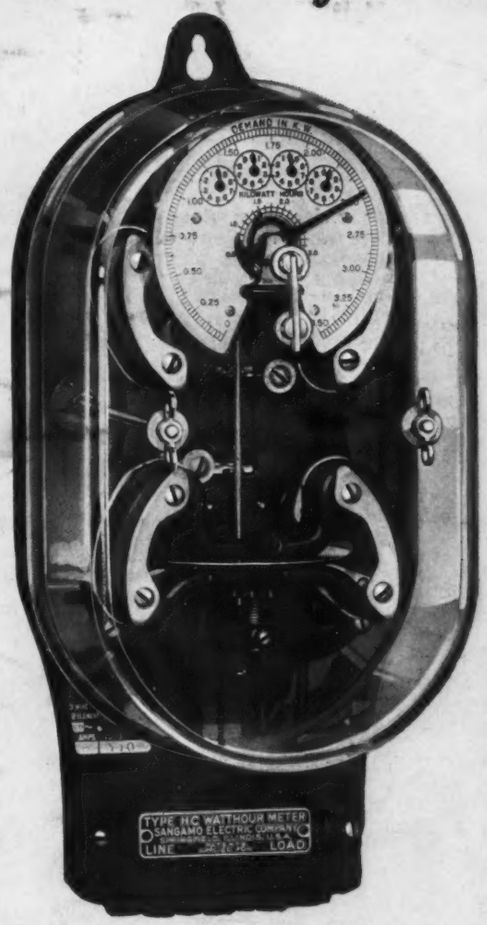
Founded 1874—Fifty-Four Years of Service

Electrical World

McGraw-Hill Publishing Company, Inc. OCTOBER 13, 1928 Twenty-five Cents Per Copy

SANGAMO

METERS *for* YOUR FUTURE LOAD



SANGAMO'S interest in the building of well-balanced and profitable load on public utility systems, is evidenced by the numerous Sangamo contributions to improve metering practice . . . Sangamo Service to the Industry.

The meter illustrated is a two-element, three-wire, singlephase type HC, fully compensated and equipped with the simplified type HB demand register having 300 per cent load capacity, both meter and register being recent Sangamo developments. In addition to registering kilowatthour consumption, it indicates the progress of the kilowatt demand for each interval and records the highest kilowatt demand.

All Sangamo Type HC Meters have fundamental characteristics that anticipate future load development. They have a straightline load curve up to 300 per cent, are compensated on both inductive and non-inductive load for variation in temperature from 20° to 120° F., have excellent voltage and frequency characteristics and are simple and dependable.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD . . . . ILLINOIS

This is an advertisement appearing on page 201 of the McGraw-Hill Electrical Engineering Catalog, just off the press

METROPOLITAN DEVICE CORPORATION

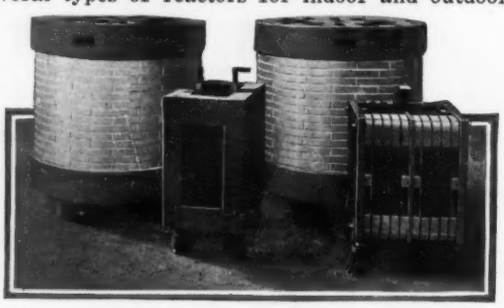
Manufacturers of Metropolitan Protective Devices (Murray Patents)

1250 Atlantic Avenue, Brooklyn, N. Y.

Current Limiting Reactors

Designed for limiting the amount of current flowing from any part of an electric generating system, during a short-circuit disturbance, into the apparatus or connections of such system. They also afford considerable protection to the system by localizing high-frequency surges and thereby preventing them from spreading over the entire system.

Several types of reactors for indoor and outdoor in-

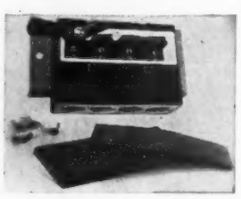


stallations are furnished depending upon service conditions and capacities. When making inquiries give: kv-a. or amp. rating of circuit; indoor or outdoor service; system frequency; number of phases; number of reactors or circuits.

Sectionalizing Units

Provide the most convenient and economical way of branching main feeders, connecting transformers to a low-tension network, connecting sub-feeders, taps and tie lines and connecting services, and for safely cutting out bad section, line or transformers with least possible shut-down time.

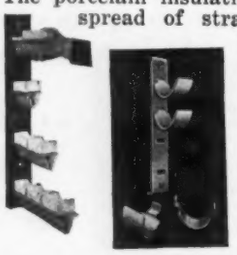
Units are of porcelain and can be assembled in a variety of combinations to permit the branching and sectionalizing of any underground system. Either or both sub-feeders or taps may be connected to either or both main feeders. Units are made in capacities up to 250 volts, 1500 amp. and 250 volts, 500 amp.



Underground Cable Racks (Manhole Type)

Consist of a heavy channel iron stanchion into which are fitted hot-dipped galvanized hangers or arms, so formed as to receive one or more porcelain insulators on which the cables bear directly.

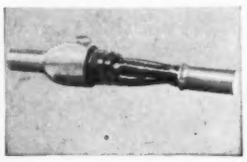
Designed for use in manholes, vaults, etc., these racks provide many advantages over the ordinary rigid types. The porcelain insulation acts as a barrier against the spread of stray current on the cable sheath through the medium of the rack. Racks may be set in any position, including ceiling mounting. Arms can be quickly changed, and installation is simple and quick.



Also available—a rack for service box mounting, made of pressed steel with slots for insertion of cable hooks. The same easy installation facilities as for above type.

High-tension Cable Joint

A patented process for insuring a definite potential gradient and eliminating voids and other objectionable flaws in cable joint insulation. The sleeve is filled with Metrolatum, a special compound. Splices of this type have been used on several 32,500-volt underground cable transmission lines.



The copper gauze stocking—the special feature of our joint—is applied just before the lead sleeve and provides a continuous metallic cover around the solid insulation to protect the latter against electrostatic charges. Using this standard package joint saves storeroom labor and no material is wasted.

Current Transformer Cabinets

Made for 2, 3 and 4 transformers—with or without end boxes. Connection blocks inside the cabinet have copper buses bolted at correct height for connecting the cables so as to avoid any strain on transformer terminals. The transformers are separately bolted. Two openings at opposite ends for main cable entrance; two knockouts on sides for cables from the transformers to the meters.

Disconnect Plugs

For use wherever electric service is to be discontinued because of non-payment, removal of tenants or withdrawal of some special service, where no meter cabinet is installed, the handle of which can be sealed "off."

It is only necessary to remove original fuse, insert disconnect plugs and seal them. The service is stopped, no wires are disconnected, the meter is not removed and it is impossible for anyone to reconnect the service without breaking company's seal.

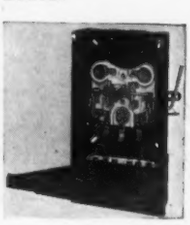
Padlock Seals

Thoroughly tamperproof meter and switch cabinet seal consisting of two parts, a steel body and a hasp of copper-plated spring wire. When hasp is pushed home, it expands in interior of seal and can not be opened except by destroying the hasp at this point.

Meter Service Switches

Easy wiring is characteristic of all Murry switches. They have ample wiring space; all connections are plainly visible; knockouts are real knockouts; twistouts for gang installations provided; sturdy and lasting construction.

Furnished in three types: AA Rotary, accessible main fuse type; Standardized, inaccessible main fuse type; "Unisafti," inaccessible main fuse type combined with accessible branch fuses.



Booklets Describing These Devices Sent on Request.

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

Vol. 92, No. 15 **October 13, 1928** *Pages 721-770*

W. H. ONKEN, JR., *Editor*

L. W. W. MORROW
Managing Editor

EARL WHITEHORNE
Commercial Editor

ALLEN M. PERRY
Associate Editor

T. P. KINDIG
Associate Editor

G. F. WITTIG
Statistical Editor

H. M. CAMERON
Associate Editor

F. C. WELLS
News Editor

FRANK B. INNES
Western Editor
7 South Dearborn St.,
Chicago

H. S. KNOWLTON
New England Editor
88 Tremont St., Boston

WALTER C. HESTON
Pacific Coast Editor
883 Mission St.,
San Francisco

E. R. SEARLES
Assistant Editor

PAUL WOOTON
Washington Correspondent
National Press Bldg.,
Washington

McGRAW-HILL PUBLISHING COMPANY, INC.
Tenth Avenue at 36th Street,
NEW YORK, N. Y.
Cable Address "Machinist, N. Y."

JAMES H. MCGRAW, President
JAMES H. MCGRAW, JR., V.-Pres. and Treas.
MALCOLM MUIR, Vice-President
EDWARD J. MEHREN, Vice-President
MASON BRITTON, Vice-President
EDGAR KOBAK, Vice-President
C. H. THOMPSON, Secretary

NEW YORK Dist. Office, 285 Madison Av.
WASHINGTON, National Press Building
CHICAGO, 7 South Dearborn St.
PHILADELPHIA, 1600 Arch St.
CLEVELAND, Guardian Building
ST. LOUIS, Bell Telephone Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie St., London, E.C.4

Publishers of
Electrical World
American Machinist
Electrical Merchandising
Engineering and Mining Journal
Chemical and Metallurgical Engineering
Bus Transportation Power
Coal Age Radio Retailing
Engineering News-Record
Electric Railway Journal
Ingeniería Internacional
Construction Methods
Food Industries
Electrical West
(*Published in San Francisco*)
American Machinist—European Edition
(*Published in London*)

SUBSCRIPTION PRICES: United States and its possessions, Canada, Mexico, and other countries taking domestic postage rates, $5 a year. All other foreign countries, $9 a year. Single copy, 25 cents. Published weekly. Entered as second class matter, Jan. 20, 1907, at the Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U. S. A.

Copyright, 1928, by McGraw-Hill Publishing Company, Inc.

CHANGE OF ADDRESS

Subscribers are requested to send both the old address and the new address when they move to a new address.

Member Audit Bureau of Circulations. Member Associated Business Papers.

Circulation of this issue, 18,250

Searchlight Section....54-59
Engineers' Directory..52, 53
Classified.....96, 98, 100
Alphabetical Index.....102

In This Issue

Method of Handling Interconnected Operation... 725

By C. B. HAWKINS AND W. W. EBERHARDT

Station loading and most economical use of system capacity controlled at central point, but switching operations in local unit are supervised by divisions. How voltage, frequency and regulation are controlled.

2,562-Ft. Head Developed.....733

Required $25,000 per second-foot handled. Penstock subjected to 1,100 lb. per square inch near station. Remote control used at Bucks Creek plant in California.

Executive Responsibility for Accidents..... 735

By K. R. MACKINNON

Improvements in accident records have been made, but railroads have set an example. Economic benefits of more aggressive safety work. Six suggestions for further improvement.

Selling Industrial Equipment to Power Customers. 741

By ROY THURMAN

Advantages gained by the central-station company through the specification and sale of industrial electrical apparatus. Objections to this practice analyzed and answered.

Editorials 721

Frontispiece—America's Highest-Head Plant 724

Assembled Switchboards Save Erection Time..... 732
By A. J. A. PETERSON

Staten Island Increases Oil Pressure in Joints..... 734
By F. L. AIME

Erection and Maintenance.... 738
By N. L. REA

Sixty-Ton Boiler Raised 19 Ft. Without Accident 739

Stacks Rebuilt Economically.. 739

Constant Line Regulation with Variable Power Factor..... 743
By C. O. VON DANNENBURG

8-11 Ft. Candles in Conowingo Generator Room 743

C. F. Stuart Optimistic on Farm Business..... 744

Investment-Management Firm Takes the Stage..... 745

Letters from Our Readers.... 747

Digest of Electrical Literature 748

Book Reviews..... 750

News of the Industry..... 751

Men of the Industry..... 760

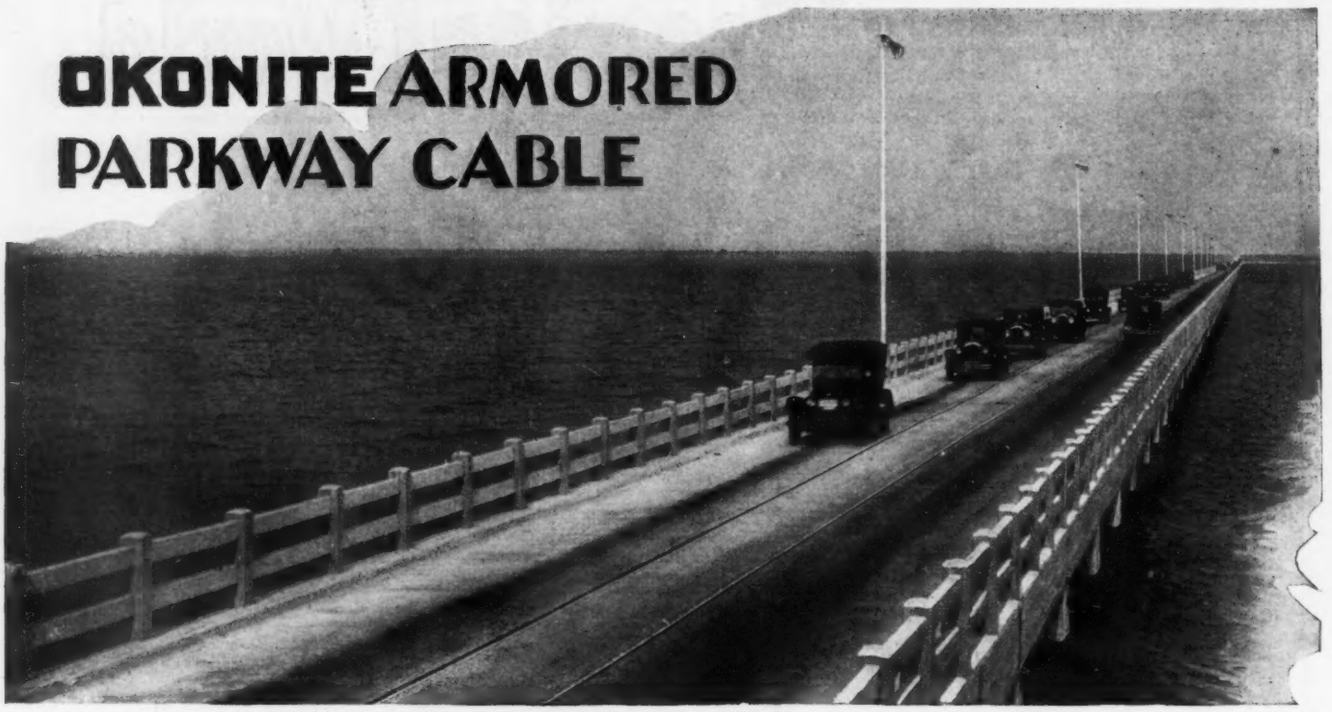
Financial and Statistical..... 762

Business News and Market Conditions 765

New Equipment Available.... 769

Electrical Patents 770

OKONITE ARMORED PARKWAY CABLE



An Okonite Armored Cable Installation, Gandy Bridge, Tampa, Fla.

ITS QUALITY ASSURES PERFORMANCE

Okonite Armored Parkway Cable provides an ideal installation for ornamental pole lighting in connection with bridges, causeways, boulevards, parks, playgrounds and private grounds. It is equally adaptable for underground services to houses and other electric work where sub-surface connections are necessary.

This type of cable is easily installed and at a much lower cost than a system consisting of separate cable and conduit. It combines the functions of both cable and conduit and, when perfectly made of the best materials, the necessary dependability of performance is assured.

Such assurance is obtained with Okonite Armored Parkway Cable, which was developed after mature study and not merely to market a new product. It was realized that this kind of installation inherently requires unfailing performance since the difficulty of locating faults and making repairs is too serious a matter to allow the use of anything cheap or experimental.

Okonite Armored Parkway Cable is made with either magnetic or non-magnetic armoring. Advice will gladly be furnished on any installation problem and a copy of our booklet—"THE STORY OF PARKWAY CABLE"—will be mailed to you on receipt of the coupon below.

E.W. 10-13-28

The Okonite Company
501 Fifth Avenue
New York, New York

Please send me a copy of your booklet
THE STORY OF PARKWAY CABLE

Name _____

Company _____

Street _____

City _____ State _____

The Okonite Company

The Okonite-Callender Cable Company, Inc.

Factories: PASSAIC, N. J. PATERSON, N. J.

Sales Offices: New York Chicago Pittsburgh St. Louis Boston Atlanta Birmingham San Francisco Los Angeles Seattle Dallas

Novelty Electric Co., Philadelphia, Pa.

F. D. Lawrence Electric Co., Cincinnati, O

Canadian Representatives:
Engineering Materials Limited
Montreal

Cuban Representatives:
Victor G. Mendoza Co.
Havana

OKONITE

1878 OKONITE QUALITY STANDARDS 1928
Unchanged for Half a Century

Electrical World

McGraw-Hill Publishing Company, Inc.
JAMES H. MCGRAW, *President*
EDGAR KOBAK, *Vice-President*

W. H. ONKEN, JR.
Editor

VOLUME 92 — *New York, Saturday, October 13, 1928* — NUMBER 15

Power Interchange with Industrial Plants

INDUSTRIES requiring process steam or having waste heat that can be used for local power generation are the chief ones which have not been convinced of the value of purchased power. Where the power requirements do not coincide with the steam or waste heat available it has been possible in many instances to persuade the industrial managements that purchased power is more economical for the non-coincident power requirements.

But Col. F. N. Gunby, a prominent New England industrial consultant, expressed the opinion recently that such industrial firms and utilities can profit still more by establishing the same relationship that now exists between interconnected utilities. He confines his remarks to industrial plants using more than 500 kw. The chief value to utilities of interchanging power with industrial plants will be the opportunity to demonstrate the value of purchased power. To the industrial properties it will afford a means of overcoming uneconomical methods.

Already, in various parts of the country, such arrangements have been made to a limited extent. The chief difficulties that prevent more interchange agreements are that the surplus power from industries is usually available when utilities cannot utilize it and that attachment of a number of industrial isolated plants to utility systems would hazard continuity of service. As Colonel Gunby says, each case will require individual consideration, but if the problem is approached with the same spirit that has brought such extensive interchange between power companies, the solution should be found.

* * * *

Co-ordination Needed in Lightning Investigation

SO MUCH money and effort are being expended by various manufacturers, educational institutions, utility companies and others to determine the nature of lightning and how to gain protection against it that the problem seems certain of eventual solution. Because of lack of co-ordination and concentration of these efforts, however, money and time are being in large degree wasted compared with what they might accomplish. In one of the papers on lightning at the recent Pacific Coast A.I.E.E. convention a plea was made for co-ordination of effort and the gathering together of results for recording, analysis and dissemination. It was further pointed out that data must be gathered from widely scattered sections of the country and that unless there is some unity of action much effort will be wasted and many valuable data lost.

These suggestions are good, but what is needed in addition is a committee, perhaps representing the Institute, the N.E.M.A. and the N.E.L.A., which could direct research and the gathering of field data. Such a committee should be representative of all the interests concerned and funds jointly raised should be made available for conduct of the work. By enlisting the aid of the Weather Bureau, with its thousands of observing stations; the Forestry Service, the fire prevention committee of the Petroleum Institute, electrical manufacturers, utility operators and the research departments of universities, the committee would be able to direct the work of these groups in an intelligent manner and to insure that there would be little duplication of effort. Different phases of the investigation could be assigned to groups best fitted to handle them, and through proper correlation of data a degree of concentration could be brought to bear on the problem that would mean its solution in a minimum of time and at a minimum of expense to the industry.

* * * *

Government Ownership of Muscle Shoals

ALL of the political parties talk of water power as though it were a great issue. Millions of horsepower still await development, but unfortunately the market for the energy is not at hand, so that the water-power sites are at present almost valueless. When, however, the art has advanced to a point where it will be practicable to develop these powers the enterprise of the electric light and power industry can be counted on to harness the water and to transmit the energy far and wide.

Of all the water-power sites, developed and otherwise, few have received as much attention as that at Muscle Shoals. The government erected a huge station there supposedly as a war measure, but the war was over long before the water-power plant was finished. Now there are honest differences of opinion about what to do with Muscle Shoals. The government disposed of almost all of its other "war babies," and it was the purpose of the Harding administration to sell Muscle Shoals also.

But if the government wishes to keep Muscle Shoals for research purposes and national defense, that is the government's business and there can be no legitimate objection to it. The electrical industry does not for one moment presume to tell the government how it shall conduct its affairs, and to say that it opposes the use of Muscle Shoals for the purposes for which it was erected is false. However, when politicians seek to pervert that purpose and to put the government into the power business in unjust competition with its own citizens, the

electric light and power industry does object and will object with all the means at its command.

Herbert Hoover's statement anent Muscle Shoals is not so startling as it sounds. The famous Tennessee River project is still owned by the government, and the byproduct of surplus power is being disposed of "on such terms and conditions as will safeguard and protect all public interest." As a matter of fact, the water-power end of Muscle Shoals is the only profitable portion of the costly experiment made there, and what fault can be found with an industry which, seeking no subsidy or gifts, buys at the market price power which would otherwise be wasted?

* * * *

Exit the Kilowatt Bargain Counter

BARGAIN-COUNTER methods in interconnection practice are rapidly disappearing. Co-operation in handling plants and lines among companies associated for the regional supply of energy at minimum over-all cost has become the custom in many territories formerly strongholds of individualized station operation. Plenty of problems remain to engage the engineer's interest, but, on the whole, the relations between the parties to tie-line administration stand today on a higher plane than ever before, and the able practitioners of the art display a new mastery of its technique.

Dump power in hydro systems continues to sell at prices often but a fraction of firm power rates, but the co-ordination of power resources through wisely managed interconnection is increasing the value of much water that formerly would have been wasted or sold at bargain-counter prices. Before interconnection fuel-burning plants supplied loads now served in part at least by hydro systems whose output can be marketed to the advantage of all concerned by the use of tie-line facilities.

Some loss of freedom is the price of operating systems in a power exchange group. It is hard for executives to see a plant of recent design and proved high economy under test runs tossed into the pool to bring forth weekly and monthly "B.t.u. per kilowatt-hour" indices considerably higher than the economy of which it is capable. The periodic casting up of the economic balance of the interconnected systems, however, generally reconciles the several boards of directors to the strategy of regional service which at times retires the units of the favored station to the floating turbine population, so to speak.

* * * *

Oscillation in Reactance Coils

IT IS usually assumed that a traveling wave or voltage pulse is materially slowed up, if not stopped, by an air reactance coil. Such coils have been used for many years in high-voltage circuits for this protective purpose. The current-limiting reactors in the buses and connections of power systems have in general a different purpose, but these coils also partake of the character of the protective coils to the extent that each is an air coil.

That an air coil may of itself oscillate, as the result of the impact of a steep wave form, and that such oscillation may result in greatly increased values of voltage, is now announced as the result of some recent work reported by Dr. Rogowski in the *Archiv für Elektrotechnik*. The fact is not so surprising, since every electrical system may oscillate; but it is of great interest in that apparently it has not been shown before nor its importance as a danger appreciated. The experiments showing the oscillations in an air reactance under the impulse of a rectangular voltage wave have been made possible by the cathode-ray oscillograph, which is now extending our knowledge of phenomena of extremely short duration in so many directions. Under a rectangular impulse such a coil is shown to oscillate in, as it were, a wide loop of current in the center of the coil, with two nodes at each end of the loop, and beyond, toward the ends, two loops of lesser amplitude and opposite phase.

Analysis of the results indicates that very high values of voltage may occur in reactance coils if the impinging wave is itself oscillating—a type which may commonly arise as, for example, between a switch and an apparatus, such as a cable or transformer, which is being cut into service. It appears not improbable that some of the unexplained troubles arising in the switching of large systems may find their origin in the oscillations of current-limiting reactors. It is certain, however, that if this is the case the nature of the troubles will not be long in doubt, since we now have at hand the cathode-ray oscillograph with its remarkable powers of studying electrical phenomena which begin, continue and end within a period of less than one millionth of a second.

* * * *

General Lighting Plus

UNDER the above suggestive title, M. Luckiesh presented a paper before the recent convention of the Illuminating Engineering Society in which he emphasized the importance of localized lighting of the proper kind in addition to general lighting. Without some such paper as this a convention of that society in this year 1928 would not have been truly representative of the current thoughts and trends in its particular art.

The idea is by no means new; there has been a tendency in illuminating circles to preach general lighting to the exclusion of localized lighting. This was but the natural outgrowth of a previous tendency to use poorly designed localized lighting only. Adequate general lighting was such an improvement on the localized lighting which preceded it that the efforts to get general lighting adopted were justified. However, when this idea began to be carried so far that the advantages of proper localized lighting were being lost sight of through devotion to the general lighting idea it was well to call a halt and open up the whole subject again. Laboratory studies and industrial experience are now available in increasing quantity that make possible the more intelligent use of localized light.

It is not claimed that the campaign of illuminating engineers of the past twenty years for better general lighting as a substitute for the previous miserable localized lighting has not been a good thing. It was the best step to be taken under the circumstances and has been fully justified by the wonderful improvement that has taken place in office and industrial plant lighting as a result. The addition of localized lighting of the right direction, quantity and color to good general lighting is a further refinement which the true illumination expert will add if the user is to have the best that the lighting art now affords. Of course, it will take more study of each indi-

vidual case than is needed simply to provide general lighting; but, in the language of the author, it offers a future of great promise to the illuminating engineer who would aim to serve the world of work with the best that modern lighting can offer, and the best conditions of seeing will be found only when lighting is best in quantity, quality and distribution for the particular visual task.

With a recognition of these facts, a study of what Mr. Luckiesh terms the "new science of seeing" will become more necessary than ever for those competent to plan lighting.

* * * *

Purchased Power and Profit Margins

NARROWING profit margins in competitive industry and trade have apparently come to stay because of their association with large-scale enterprise and mass production. This is the conclusion of the National Industrial Conference Board after an analysis of more than four thousand large and successful corporations over the post-war period of 1918-25. Producers are being forced to seek profit by volume rather than profit by individual sale in many lines of activity. In this connection the investment of quick assets in such a way as to insure maximum capital turnover is becoming of increasing importance. Capital investments "frozen" into private generating plants tend to reduce this turnover, and unless engineering analysis justifies the isolated plant by a wide margin indeed, the purchase of power is the wise course of able management. The ratio of power cost to profits in various establishments is receiving study from acute buyers, and the central-station power engineer should never forget to take the capital turnover factor into consideration in discussing with industrial and mercantile customers the value of purchased service.

* * * *

Should a Power Company Sell Industrial Equipment?

WHETHER or not a central-station company should engage in the business of selling motors, heating equipment and other industrial apparatus to its power customers has long been a debated question. Practice with different companies varies. Some utilities will undertake to lay out, supply and, if necessary, finance the motor installation for industrial customers. Others confine their service only to giving advice and recommendations as to the nature of the installation. In an article on page 741 of this issue of the ELECTRICAL WORLD Roy Thurman has analyzed the pros and cons of the question, setting up the principal objections and meeting them with arguments in favor of the utility selling such equipment. It is his conclusion that both the power user and the power company will benefit by this policy and that no one is the loser.

There are many who will disagree with this conclusion—more particularly with the actual sale of the equipment by the utility. For example, many companies which do not sell industrial equipment now maintain that they would sacrifice the confidence which customers have in them as impartial advisers if they sold equipment. This relation with customers is highly important if recommendations for using electrical equipment are to bear the maximum fruit. But, aside and apart from any objections which may be raised, Mr. Thurman has made several points that commend themselves for serious consideration.

In recommending motors and control the power company is keenly interested to see that the user buys apparatus that is best adapted to his needs and which will give the best service. For the small industrial plant which does not or cannot employ a consulting engineer the power company's service is extremely valuable. Most important of all is the opportunity for personal contact between the customer and the company. It enables better acquaintance each with the other, and thus troubles can be ironed out in their inception. For this latter reason, if for no other, regardless of whether industrial equipment is actually sold by the central-station company, the utilities can ill afford to permit industrial customers to go many months without a call from a power sales engineer to see that things are running smoothly or whether any additional services can be performed.

* * * *

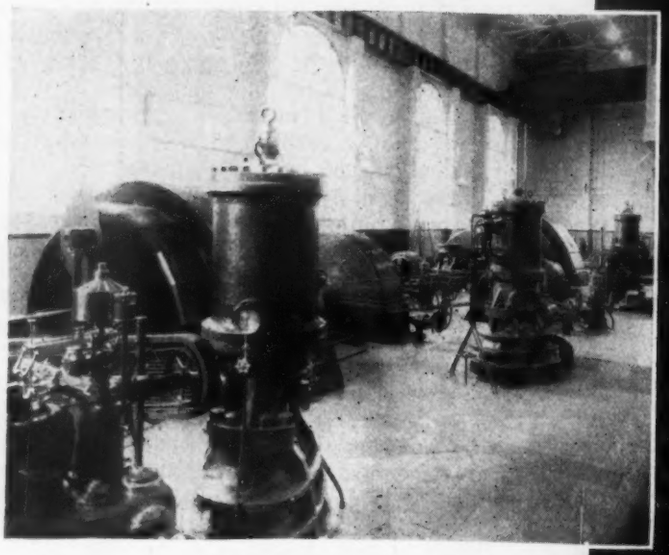
How Much Is Wiring Worth?

WIRING is a subject of intense interest at the moment. The cost of wiring, the safety of wiring, and therefore wiring materials and methods of installation and grounding, are under discussion and there is wide divergence of opinion in different branches of the electrical industry. Attention focuses in the field of residence wiring because here the cost of wiring appears to be a more important factor in the development of the market. But men do not agree either as to how great an influence cost actually has on the sale of wiring and the size of installations or how far our present standards of construction may be lowered without unwise sacrifice of safety.

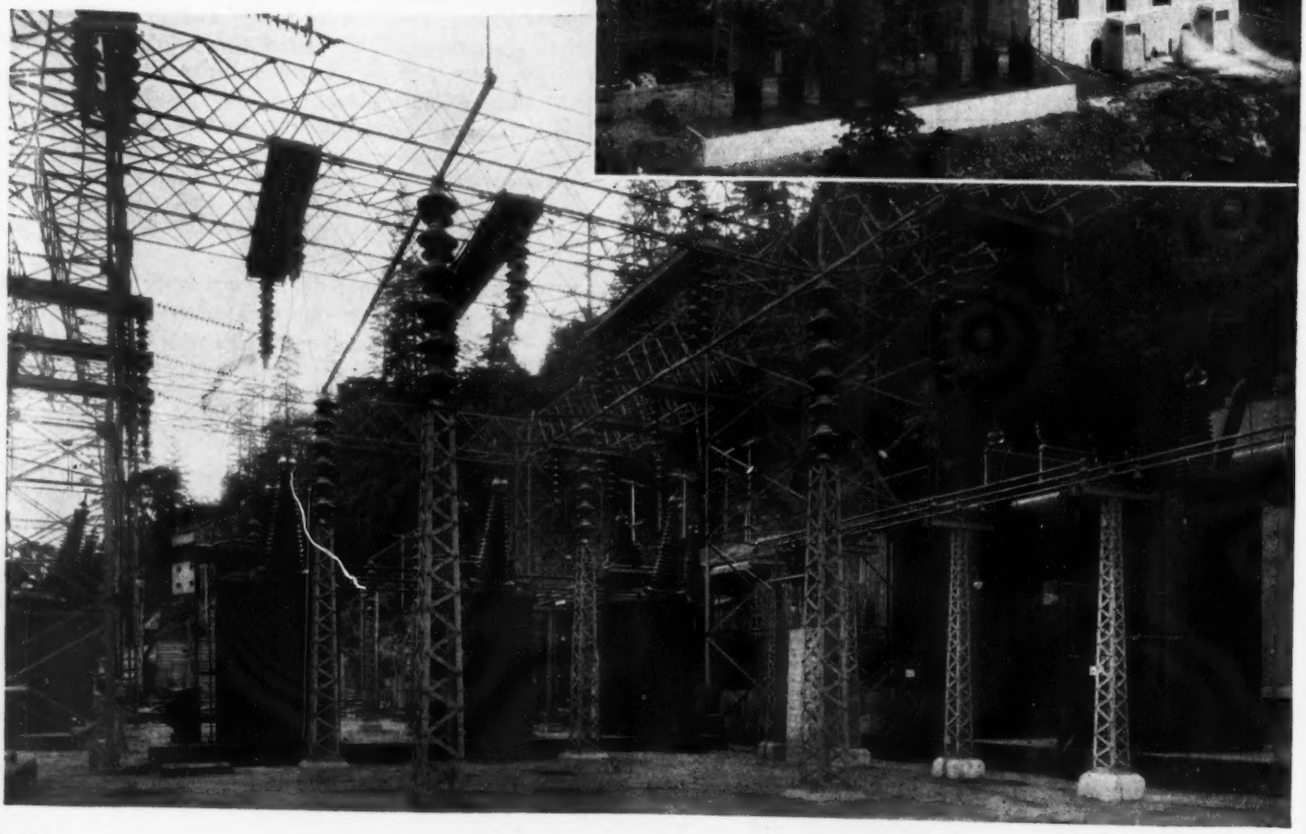
Above it and beyond it all, however, stands the inescapable fact that if the industry is to overcome the present inadequacy of house wiring and bring about the complete equipment of the home and full use of electric service, it must sell to America the idea of spending more money for wiring and not less. And the first step toward that is for electrical men to overcome their own tradition that house wiring is principally for light and only secondarily for appliances and that installations must be inexpensive in order to be sold. That idea has held back progress long enough. The need now is to get enough copper into the home, with a corresponding increase in fuse protection, to permit a family to use plenty of appliances and larger ones, anywhere, at any time, without risk of blowing fuses or overloading circuits. The public interest will be more concerned with more and heavier wiring than with cheaper wiring.

For, after all, it is not cost, but value, that establishes popular demand. Brass pipe and *de luxe* bathrooms are bought today at an expense that was unthinkable ten years ago because they are the modern standard and help make houses marketable. So will it be with wiring when complete electrical equipment has become the vogue. But this can hardly be expected until electrical men themselves have enough price courage to believe that wiring is worth what it costs, for the public will naturally accept their judgment and their valuation. The code right now provides a variety of methods and materials. Local ordinances based on the code insure considerable range of cost. Less expensive materials may come. Meanwhile, however, the situation needs confidence and not controversy.

America's Highest-Head Plant



THE Bucks Creek plant of the Feather River Power Company (now a subsidiary of Great Western Power Company of California) establishes a record for high-head hydroelectric plants in this country. The plant, which is built on the Feather River in northern California, utilizes water under a static head of 2,562 ft. and an effective head of 2,350 ft.

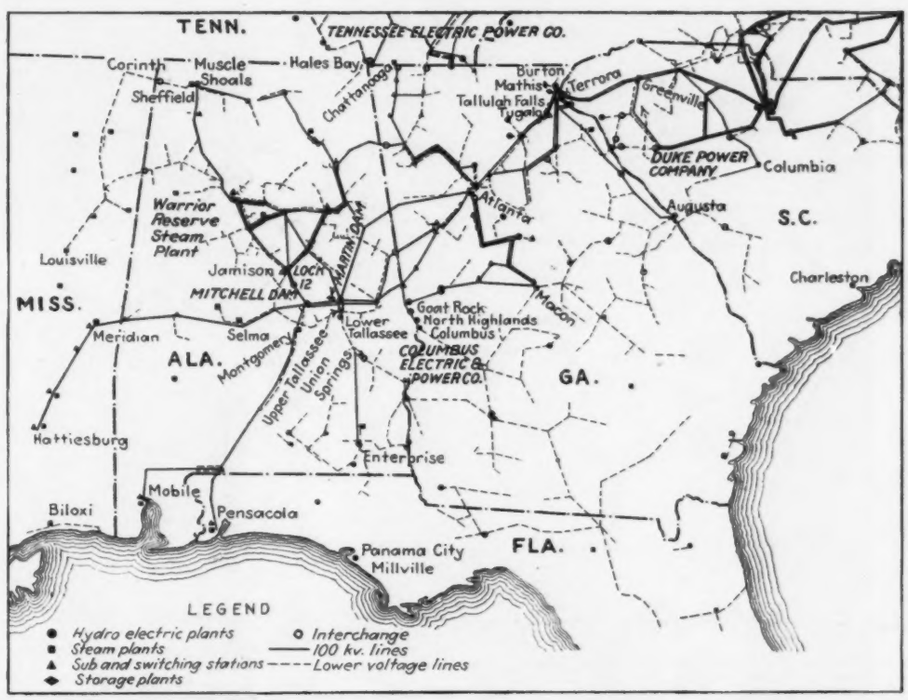


Method of Handling
Interconnected Operation

Station loading and most economical use of system capacity controlled at central point, but switching operations in local units are supervised by divisions. How voltage, frequency and regulation are controlled

By C. B. HAWKINS and W. W. EBERHARDT
Southeastern Power & Light Company

OPERATION! What a world of problems that word brings to the minds of engineers whose duty it is to see that uninterrupted service is maintained on the power systems throughout the country. Especially is this true where large systems covering the major portions of several states are interconnected and operated, in general, as a unit. Such an interconnected network comprises the system of the Southeastern Power & Light Company, and it is with the operating features of this system that this article is intended to deal.



Major properties which operate interconnected in the Southeast

The Southeastern Power & Light Company's system is composed of the Alabama Power Company, Georgia Power Company, Central Georgia Power Company, Mississippi Power Company and Gulf Power Company. These companies operate over the major portions of Alabama and Georgia, about half of Mississippi and the western portion of Florida.

There are approximately 238 miles of 154-kv., 2,270 miles of 110-kv., 405 miles of 66-kv., 1,570 miles of 44-kv. and 510 miles of 38-kv. transmission lines serving a population of approximately 3.9 million people. The generation for the system is furnished by thirteen major and 22 smaller hydro plants, located on the Coosa and Tallapoosa Rivers in Alabama and the Tallulah, Tugalo, Chattahoochee, Oconee and Ocmulgee Rivers in Georgia, and eleven steam plants, located at Gorgas, Gadsden, Atlanta, Mobile, Sheffield, Meridian, Tupelo, Corinth, Montgomery and Gulfport. In addition the Alabama Power Company purchases energy from Wilson Dam, which has an installed capacity of 180,000 kw.

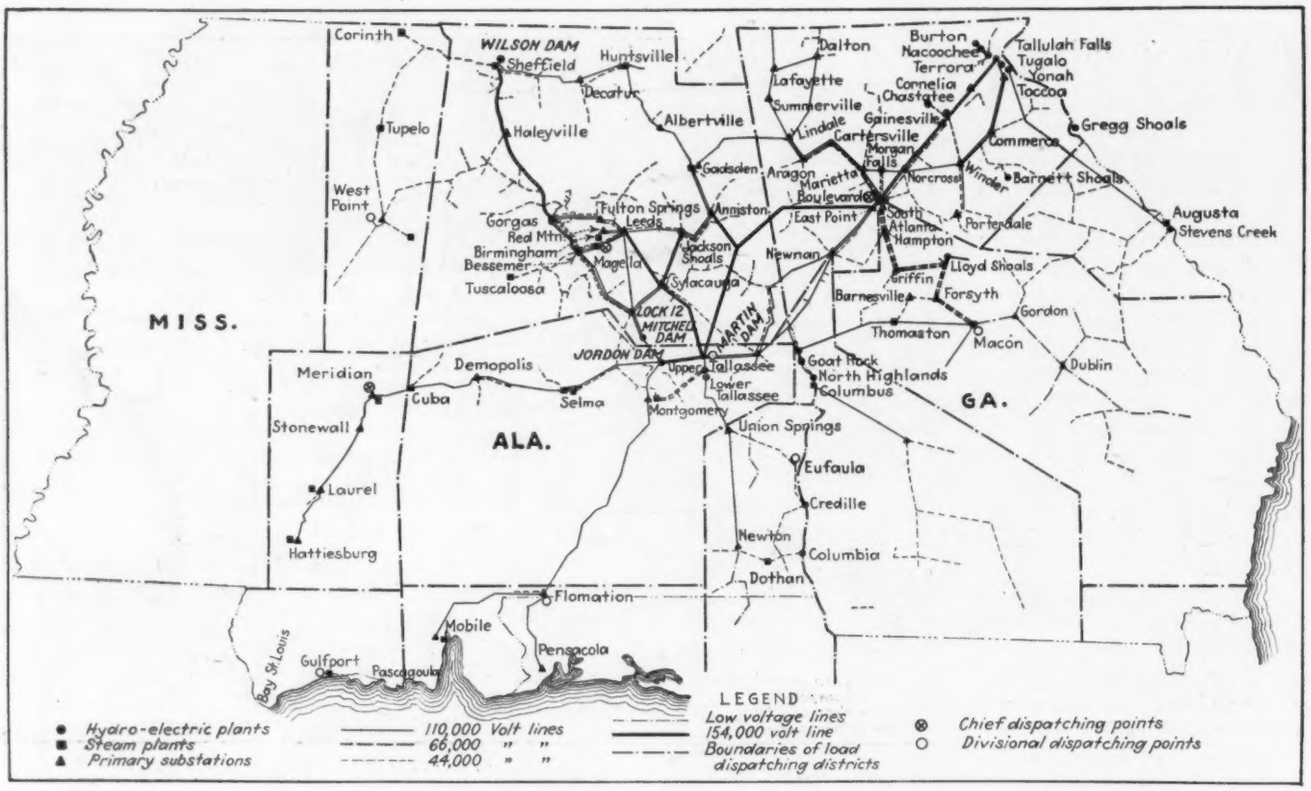
The problem of handling this system is naturally divided between a number of dispatching offices located at several points on the individual systems, as outlined below:

Alabama Power Company—The Alabama system is divided into six divisions, namely, northern, eastern, southern, western, southeast and Mobile. The chief dispatching office is located at Magella, 3 miles from Birmingham. While all other dispatching offices report to this office on all matters pertaining to operation, the Magella office actually handles the switching in the northern, eastern and western divisions only. The chief dispatcher's office, however, directs the loading of all plants on the Alabama system irrespective of their location, and can, at any time the chief dispatcher feels it is necessary, take over any lines or equipment normally controlled by the division dispatchers and issue orders concerning those lines or equipment. Owing to the splendid organization of the division offices, however, this has very rarely been done.

The southern division dispatching office is located at Martin Dam. This office handles the operation in the southern division only. The southeast division dispatcher is located at Eufaula. This office handles operation in the southeast division only. The Mobile division

dispatcher is located at Flomaton. This office handles operation in the Mobile division and on the Gulf Power Company system.

Mississippi Power Company—The Mississippi Power Company system is divided into three divisions, which are not interconnected in Mississippi. The central division comprises the 110-kv. system from Meridian to Hattiesburg, with the dispatching point located at Meridian. The northeast division consists of the 44- and 33-kv. system extending from Columbus to Corinth, with the dispatching point at West Point. These two divisions are connected with the Alabama system. The Gulf Coast division consists of the 22-kv. system extending along the Gulf Coast from Pascagoula to Bay St. Louis, with the dispatching point located at Gulfport. This division is not connected with the Alabama system.



Dispatching centers on the Southeastern Power & Light System

Georgia Power Company and Central Georgia Power Company—There are two dispatching offices on this system, located at Atlanta and Macon. The Atlanta dispatcher handles all switching on the Georgia Power Company's system, except in the Dublin division, and directs the individual plant loading on the Central Georgia system as well as on the Georgia Power Company system. The Central Georgia Power Company's dispatching office, located at Macon, handles all switching operations on the Central system and also the Dublin division of the Georgia Power Company system. The dispatching offices of each system are directly responsible to the operating engineers of their respective companies, but are co-ordinated by the Southeastern system chief load dispatcher.

In addition to this there is a chief dispatcher for the associated power companies in the Southeastern Power & Light Company, located in Birmingham. It is the duty of this dispatcher to so direct the interconnected system operation with reference to individual system loading and transfer of energy over the tie lines that full advantage can be taken of the diversity of weather conditions over the various watersheds to effect economies in operation and conservation of coal. This authority is vested in the operating engineer of the Alabama Power Company, and the operating engineers of the other associated companies report to him in such matters only. He is not responsible for switching operations on any individual system other than the Alabama Power Company.

With reference to switching orders and operations there is no centralized dispatching point, except at times when the chief dispatcher chooses to exercise his authority to take over dispatching normally handled by division offices, but with reference to plant loadings there is centralized dispatching in the chief dispatcher's office of the respective systems, and with reference to system loading and interchange energy over the tie lines there is centralized control under the chief dispatcher for the Southeastern system.

It follows from the foregoing that there cannot be one large dispatcher's board located in one office. Each division office has a separate board showing only such lines and equipment which are handled by that office. In general these boards are of the manually operated type; that is, the dispatcher must actually place or remove tags as the switching order is given or reported executed. A system of colored tags is used to indicate open and closed switches, clearances and other details essential to prompt handling of operating situations.

All switches are numbered, oil switches having even numbers and air break and disconnect switches having odd numbers. Switching orders are given by switch

numbers only, and the sequence indicated in the order is the sequence in which the switching must be done. On the boards oil switches are represented by round holes and air break switches by oblong ones, and the board is illuminated by lights placed in the cabinet which forms the back of the board.

The only deviation from this type of board is in the Georgia Power Company dispatcher's office in Atlanta. This board is electrically operated and has been fully described in a previous issue of this magazine.

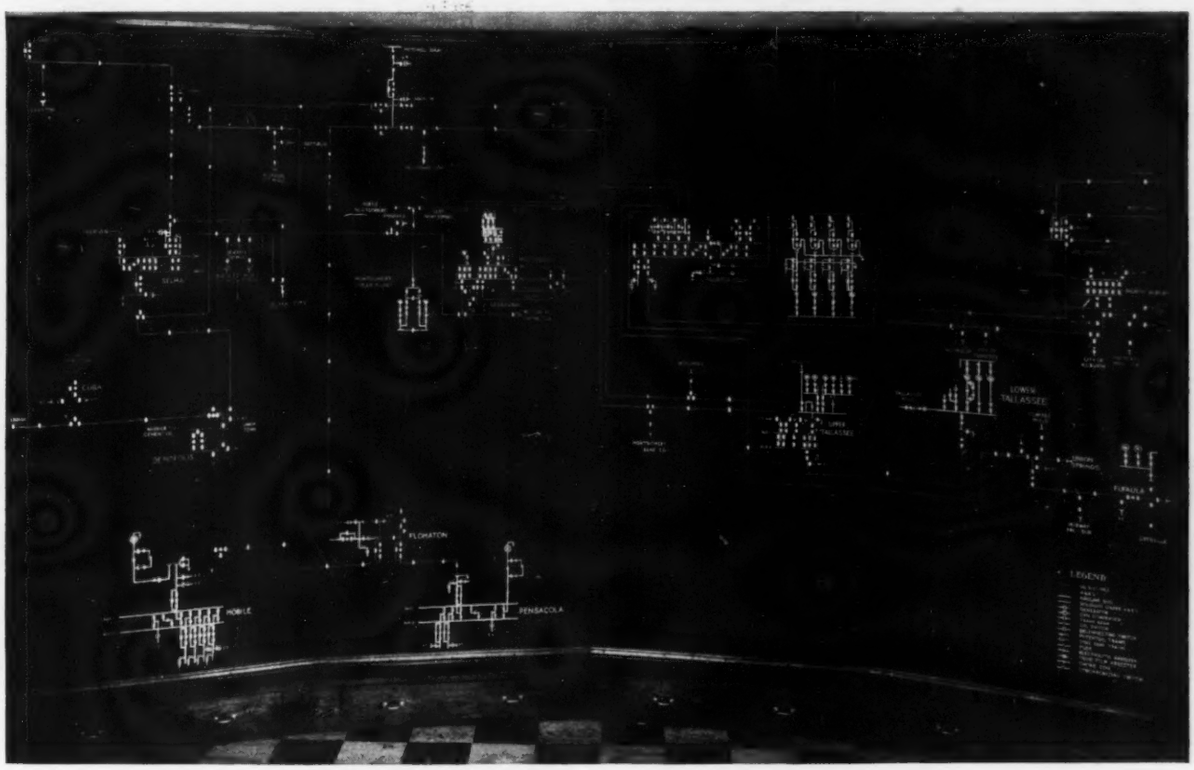
By referring to Table I it will be seen that certain hydro plants, such as the Tallulah group in Georgia and the Tallapoosa group in Alabama, are storage plants, whereas the Coosa plants, Morgan Falls and Lloyd Shoals are run-of-river plants. The principal problem is to operate this combination of storage and run-of-river hydro plants in connection with the steam plants so as to secure the maximum kilowatt-hour output from the available river flow. Not only is there a great variation in river flow from wet to dry season, as shown by accompanying hydrographs, but there is also a considerable variation from year to year which makes it very difficult to map out a load schedule in advance that will secure the maximum output from the hydro plants.

The hydro plant operations are governed by the so-called "rule curves" of the storage reservoirs which show the estimated elevation which the reservoirs should have each day of the year in order to be assured of having sufficient storage for the dry season, and still not run the lake elevation too high during the fill-up period and run the risk of wasting water during unexpected heavy rains. These rule curves are worked up in advance each year on a basis of the relation of hydro storage, hydro run-of-river and steam plant capacities to each other and to the forecasted system load. Load growth and new plant construction will of course cause the rule curve to vary considerably from year to year. The 1928 rule curve for Lake Burton is shown in an accompanying chart. The rule curves are prepared in the operating engineer's office in Birmingham and daily load orders governing plant operations on the Southeastern Power & Light Company's system originate in this office.

Plant Operations Based on Seasons

As far as plant operations are concerned, there are three distinct seasons of the year, namely:

Jan. 1 to May 1—Wet season and fill-up period on storage reservoirs. During this period the run-of-river plants are operated in the base of the load curve with the steam plants and storage plants operating in the peak.



Load dispatcher's board for use in division offices

The division of the peak load between the storage hydro and steam plants depends on available generation at storage plants, which is determined from the rule curves for the storage reservoirs.

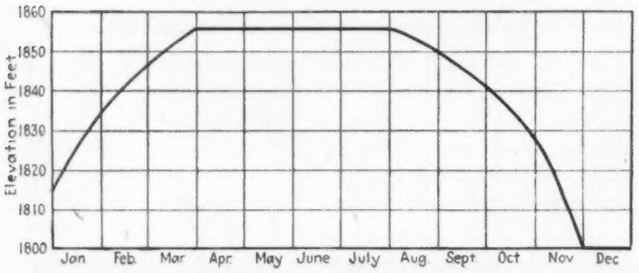
May 1 to Sept. 1—Medium river flow conditions—storage reservoirs normally full. During this period the river flow is passed at both run-of-river and storage hydro plants. The position of hydro and steam plants in the load curve is determined by the amount of river flow, which may vary considerably, as indicated by the hydrographs. It will be noted that the rule curves do not call for filling the storage reservoirs to the brim, but allow some leeway at the top to take care of possible floods which occasionally occur during this season of the year.

Sept. 1 to Jan. 1—Dry season and draw-down period on storage plants. Storage hydro plants are operated in the base of the load curve up to the capacity determined by the rule curve. Steam plants are also operated

in the base and run-of-river hydro plants carry the peak load within the capacity of the river flow.

System load curves for the dry and wet seasons are shown in accompanying figures, in which the allocation of run-of-river hydro, storage hydro and steam capacity has been indicated.

During high flow periods, when water is wasting over



The 1928 rule curve for Lake Burton

the spillways, hydraulic efficiency is of no consequence, but maximum output is all important and the hydraulic units are then operated at maximum gate opening. During low flow periods hydro units are operated at the most efficient gate opening as far as possible and steam plants are given as nearly a uniform load as possible.

It has been found to be more economical to carry the load swings on hydro plants rather than on steam plants and consequently all regulating is done at either one or more of the large run-of-river hydro plants during the dry season or at one of the large storage plants during the wet season. These plants are known as "regulating plants," the principal ones being Lock 12 on the Coosa River, Martin Dam on the Tallapoosa River in Alabama and Tallulah Falls and Tugalo plants in North Georgia.

Another advantage in regulating with hydro plants is that they are more flexible in picking up load in the morning, in taking the noon dip and in dropping off load at night. The hydro plants can also take care of these rapid load changes more economically than steam plants because there is no responsibility of wasting steam due to sudden falling off in load and no liability of shortage in capacity because of an insufficient number of boilers being ready.

When hydro units are carrying the load swings a distinction is made between load-carrying units and units operating for power-factor correction. The load-carrying units are loaded in such a way that the load will swing over the most efficient section of its operating curve, namely, from five-tenths to eight-tenths gate opening. When the load falls below five-tenths gate opening then an effort is made to take one unit off the line or set it on zero gate opening with draft tube vented and carrying only wattless current. Because of the size of the system and number of hydro units available at either run-of-river or storage plants, it is generally possible to take care of additional load by placing an additional unit on the line at a good gate opening without disturbing settings of units already on the line, and *vice versa* for drops in load.

The hydro plants in carrying the variable loads will, of course, be generating in excess of the river flow during the peak load hours, this excess being taken from storage, and during the night the hydro generation will be reduced below the river flow to such an extent that the pond level will be brought back to normal at the beginning of each day. With this operation the steam generation required may be evenly distributed and operated at a very good load factor.

The river flow will naturally vary from day to day,

TABLE I—PLANT CAPACITIES ON SOUTHEASTERN SYSTEM

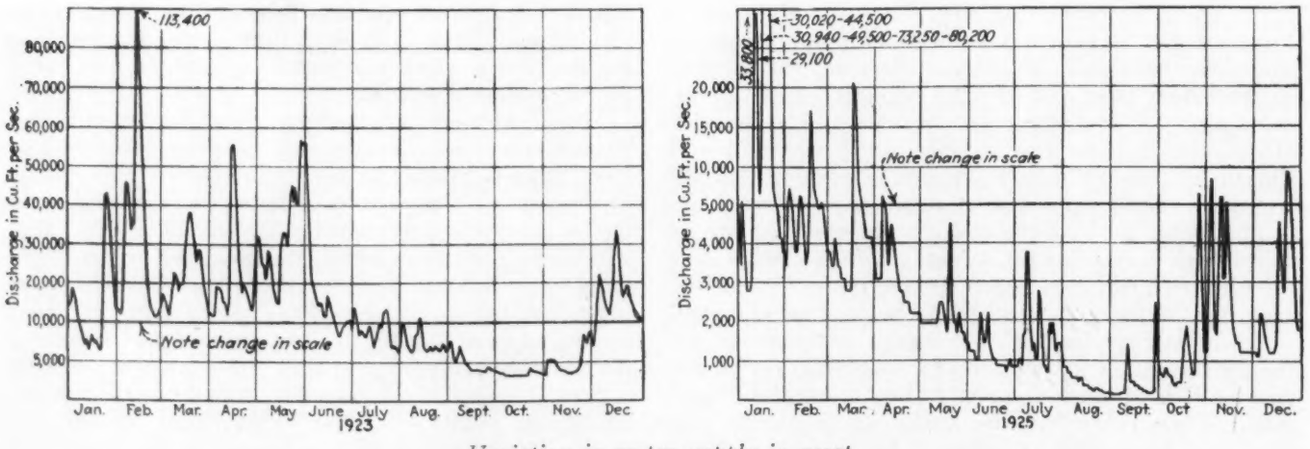
Small plants and customer plants ommitted. Does not include a number of small plants totaling approximately 50,000 kva.

Hydro

Plant	Installed
Lock 12	81,000 kva.
Mitchell Dam	60,000 kva.
Martin Dam	112,500 kva.
Upper Tallassee	38,000 kva.
Lower Tallassee	10,200 kva.
Burton	6,800 kva.
Nacoochee	6,000 kva.
Terrora	20,000 kva.
Tallulah Falls	72,000 kva.
Tugalo	50,000 kva.
Yonah	25,000 kva.
Lloyd Shoals	18,000 kva.
Morgan Falls	21,000 kva.

Steam

Gorgas	83,333 kva.
Gadsden	12,500 kva.
Montgomery	6,000 kva.
Davis Street	11,250 kva.
Mobile	5,463 kva.
Gulfport	9,000 kva.
Meridian	5,000 kva.
Tupelo	4,375 kva.
Corinth	2,250 kva.
U.S.N.P. No. 2 (leased)	70,500 kva.
Chickasaw (leased)	10,000 kva.
Total	740,171 kva.

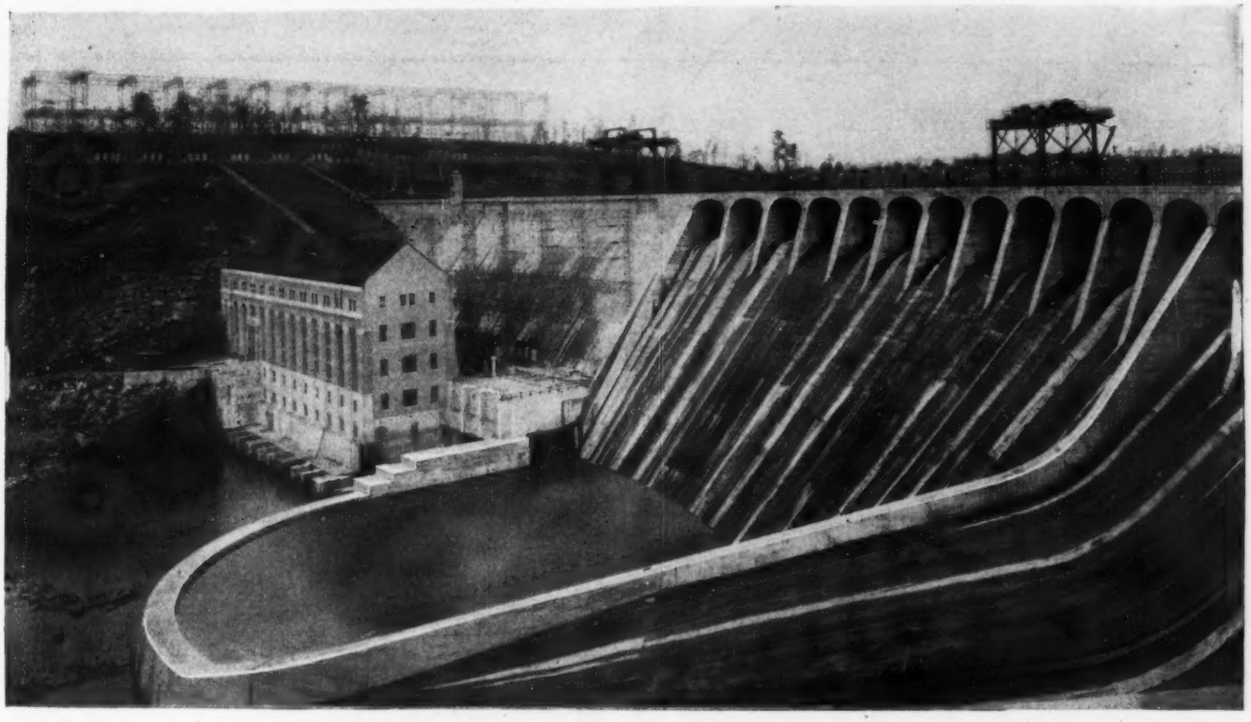


Variation in water supply is great

Left—Coosa River hydrograph. Right—Tallapoosa River hydrograp

and since the object is to develop the maximum output from this flow, it is imperative to keep a close check on the river flow during the dry season. The pond elevations must be maintained as high as possible so that the turbines will be operating at the most efficient head during the peak hours. When considerable water is anticipated from rains, which have already reached the river, the question of efficiency becomes subordinated to conservation of water and the pond elevations are drawn down to provide storage capacity for the anticipated flow and wasting as little as possible over the spillways.

During heavy floods, when it is seen that water will have to pass over the spillway, an effort is always made to open the spillway gates in advance of the arrival of the crest of the flood and thereby flatten out the peak and minimize the effects of the flood to the territory below the dams.



Martin Dam of the Alabama Power Company

Important Operating Data

In order to operate the system economically in accordance with the fundamental loading plan, the load dispatchers are furnished with the following information:

1. Efficiencies of both hydro-electric and steam-generating units at different loads.
2. Rainfall and river gage readings from headwaters of all streams and time required for water to reach plants.
3. Delay of water between plants in series on same river and amount of storage at each plant so that the proper amount of water can be passed from one plant to another and thus keep all the plants operating at maximum head efficiency without wasting water.

The load dispatchers must be acquainted with loads to be carried and with any unusual conditions which will affect hour-to-hour operation. They must also be acquainted with conditions of plant equipment and their ability to carry load. No apparatus affecting capacity of plants can be taken out of service without the advice of the load dispatcher.

Load schedules are worked out a week in advance, the forecast being based on current load demands and actual water in the rivers, with due allowance made for the possible influence of existing weather conditions on the river flow.

Frequency Control Varies in Location

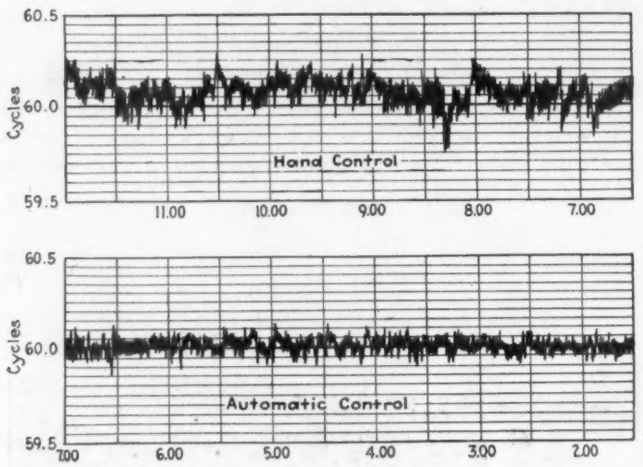
On such a system there is a wide diversity in load, so that load swings will vary from five to thirty thousand kilowatts. Since this is a combination hydro and steam system no one plant is assigned the task of maintaining the frequency all the time. The selection of the plants to regulate frequency will depend not only on load conditions, which will vary during the day, but also on seasonal river flow conditions. As a rule, one plant in Georgia and one plant in Alabama will regulate frequency, the plants to be used being selected by the respective system dispatchers.

During the wet season of the year the stream flow plants are generally operating on the base, with the steam plants next, and the storage plants on the peak to carry the load swings and regulate frequency.

During the dry season, when the storage and steam plants are operating on the base, the stream flow plants will, of course, supply peak capacity and regulate the frequency. If conditions demand a heavy interchange of energy over the tie lines, then a plant on the system which is receiving the power will be designated by that system's dispatcher to regulate the frequency, as the system supplying the load will probably be loaded, and will not have excess capacity for this purpose.

From the foregoing it can be seen that a practice is not made of giving speed regulation to the steam plants,

since more economical operation can be obtained if these plants are operated under steady load conditions, as has already been pointed out. The hydro plant having the more sensitive governors is selected, as far as conditions will permit, to control the speed. It is the usual practice to set the governors to the same degree of sensitivity, and use a sufficient number of machines to provide



Experiments with automatic control have enabled maintaining frequency within 1/20 cycle plus and minus

swing capacity and operate them at the best gate, thus combining speed control with the most efficient operation.

In order to maintain proper frequency a means of determining accurately the frequency at which the system is operating must be had. For this purpose Leeds & Northrup frequency recorders are installed in the load dispatchers' offices and at the generating stations. At periodic intervals these recorders are carefully checked and compared, not only on the Southeastern system but also with other companies interconnected with Southeastern, such as the Tennessee Electric Power Company. Warren master clocks are also installed in the generating stations and aid materially in holding an average frequency throughout the 24 hours.

While an effort is made to maintain the frequency as close to 60 cycles as possible, it has been found that a variation of about two-tenths cycle, plus or minus, is about as close as can be maintained under hand control. Some experiments have been made with automatic regulation, by which it has been found possible to limit the deviation from 60 cycles to one-twentieth cycle, plus or minus. It is planned to adopt automatic regulation as soon as all details are satisfactorily worked out. At present automatic regulating devices which were developed by two of our plant superintendents are being used with much success, as shown by accompanying figures, one being a frequency chart taken during hand regulation and the other a chart taken with automatic device in operation.

It can be seen that the problem of frequency control on such a system as the Southeastern Power & Light Company is somewhat more difficult than on a metropolitan system, since the control must of necessity be carried out principally by the hydro plants with governors which are less sensitive than steam governors. Varying conditions of operation also make it impossible to follow any cut-and-dried rule which probably applies on many systems.

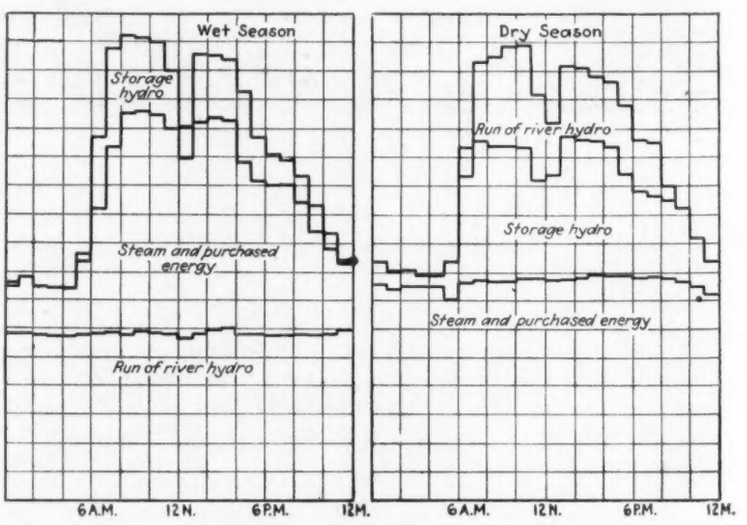
The Southeastern Power & Light Company system voltage is controlled at both generating plants and substations. The generating station voltage is raised to a maximum during the peak load hours and depressed as far as possible at night to counteract the rise in voltage on the high-tension lines when they become unloaded. Only a part of the regulation can be taken care of in this way, however, and synchronous condensers are required at strategic locations to maintain proper voltage on the network. The principal condenser installations are as follows:

CAPACITY OF PRINCIPAL CONDENSER INSTALLATIONS

	Kva.		Kva.
East Point	20,000	Sheffield	7,500
Lindale	15,000	Gadsden	5,000
Bessemer	15,000	Meridian	5,000
Leeds	12,000	Hattiesburg	5,000
Mobile	10,000	Pensacola	5,000
Huntsville	7,500		

In addition to these condenser installations considerable use is made of idle generator capacity for power-factor correction. A 20,000-kw. steam turbo-generator unit at the Gorgas steam plant is equipped with a shaft coupling between generator and turbine which can be disconnected to allow the generator to operate as a synchronous condenser during times when the steam plant is idle.

The draft tubes of practically all waterwheel units are vented so as to permit operation of idle waterwheel generators as synchronous condensers with minimum losses. In an extensive interconnected system having a combination of run-of-river hydro, storage hydro and steam plants, such as the Southeastern Power & Light system, there will always be generators at certain plants, depending on seasonable conditions, which can be used as condensers. Whenever available, such condenser capacity is used, thus saving an investment in straight synchronous condensers.



System load curves vary with season

Left—Wet season load curve. Right—Dry season load curve.

Changing of transformer taps under load is practised

at several locations. So far it has not been found necessary to install phase-shifting devices, but such equipment may be used in the future to control the load division over certain tie lines if experience demonstrates the advisability of such action.

The problem of synchronizing between systems is one which has not presented any very great difficulty. Most of the system synchronizing is done between the Georgia and Alabama systems. Due to the practice mentioned above of making periodic simultaneous comparisons of the frequency recorders in the various load dispatchers' offices, and the practice of maintaining frequency as close to 60 cycles as possible, very little time is lost by the operators at the time points in synchronizing two systems in case of a separation.

It is the general practice for the Alabama system to make all lines hot to the other systems and for the operators at the tie points to synchronize. If one line only kicks out, it is energized in one minute. If all tie lines go out they are energized as quickly as the dispatcher can issue the orders. This method of operation is one which is easily obtained on interconnected systems under the same control and dispatching system. It would be difficult to secure the close co-operation necessary in such cases between independent systems.

Communication Essential to Success

No system can be properly handled without communication, and to the degree that communication is reliable and satisfactory just to that degree can efficient load dispatching be carried out. The communication facilities of the Southeastern Power & Light Company include land lines, carrier current and emergency patrol circuits.

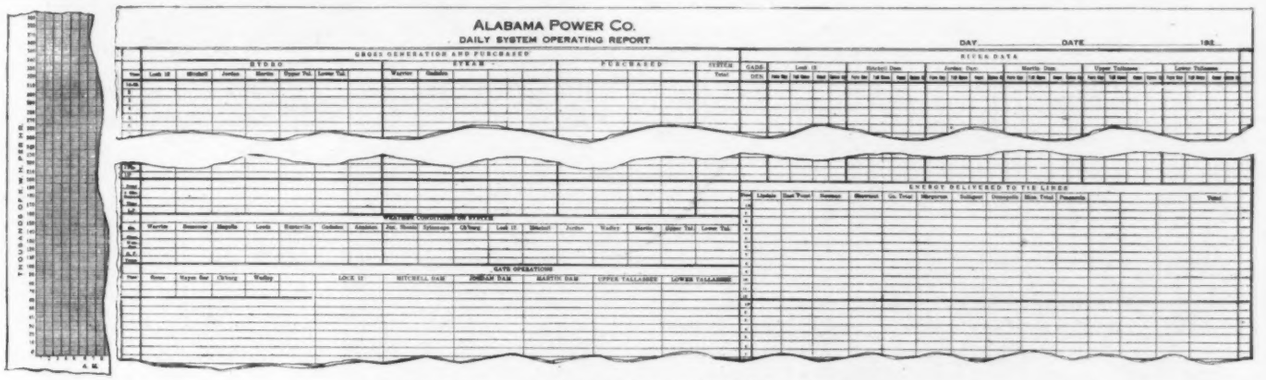
Carrier current is installed on new high lines where distances make cost of land lines prohibitive, and parallel to land lines when traffic demands additional facilities. Emergency patrol communication using audio-telephone equipment has been provided on certain 110-kv. lines in the form of insulated ground wires where land lines are not available. This circuit occupies the position of customary ground wires on "H" frame structures, except that it is insulated from the structure. The circuit is normally used for supervisory control of line sectionalizing switches, but special patrolman's protective boxes are provided at 2-mile intervals for emergency communication.

Carrier-current communication is being provided between the Alabama dispatcher's office in Birmingham and the Georgia dispatcher's office in Atlanta. It is expected that this will greatly facilitate the handling of operation on the tie lines.

Statistics and Records Used

In connection with operation, there are naturally numerous records and data that must be kept if an accurate picture of system operation is to be had and a means of forecasting load conditions and generating requirements is to be available. This information is secured from the various forms, such as trouble reports, voltage reports, switching reports, daily generating reports, load dispatchers' system daily operating reports, etc.

From the standpoint of forecasting load requirements and arranging for generating capacity, the load dispatchers' daily system report is the most important of these forms. This gives the hourly generation, weather, river and storage condition at each plant and the system load curve. The illustration shows the form used by the chief dispatching offices of the various associated companies on the Southeastern system. This report is made up daily by the chief dispatcher's offices and sent to the operating engineer's offices of the respective companies. From the operating engineer's office these data are communicated to the statistical department, where all data are combined into one preliminary daily operating report for the Southeastern system. Copies of this report are then sent back to the various interested departments.



Portions of load dispatcher's daily report

In addition to these reports, advantage is taken of complete rainfall and river flow data covering a long period of years in forecasting generating capacities and outputs to meet the expected load growth several years in the future.

Summary of Operation

In summarizing the various points mentioned in the foregoing, it is evident that the dispatching organization is arranged to obtain the maximum benefits from the diversity of weather conditions over the various watersheds in Alabama and Georgia, by having one centralized dispatching point, with reference to interchange power and system loading. Divisional dispatching with reference to switching operations offers the advantage of relieving chief dispatchers of much detail and makes for faster restoration of service in case of an outage.

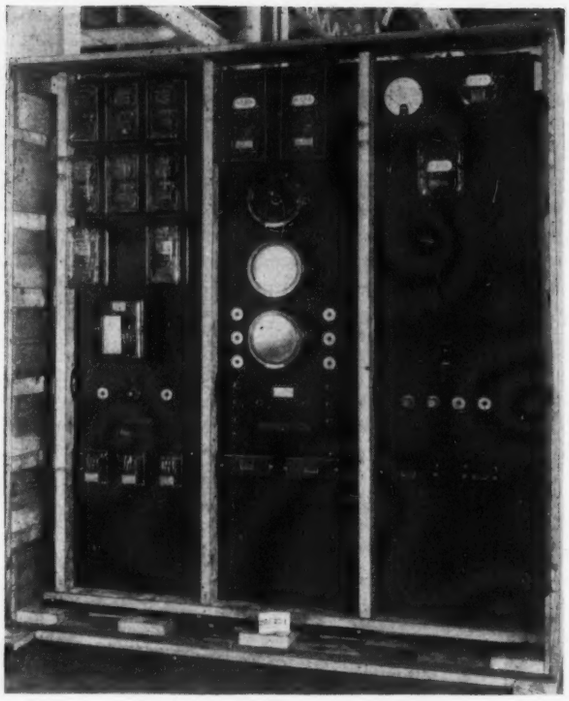
Constant study of all factors which influence operation by the operating departments of the Georgia and Alabama companies and the condensing of these studies provide a basis upon which the entire system is operated.

Assembled Switchboards Save Erection Time

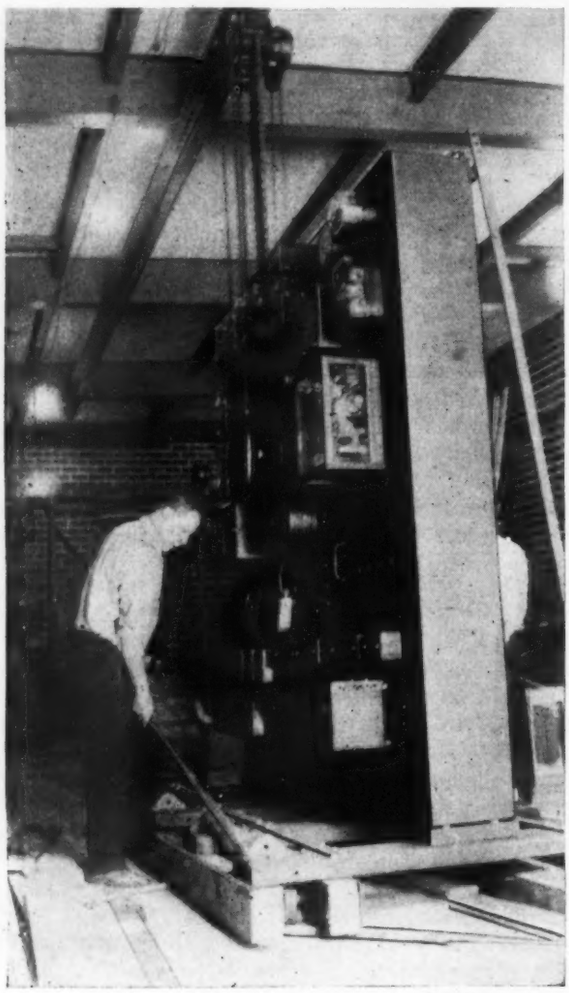
By A. J. A. Peterson
Switchboard Engineering Department,
Westinghouse Electric & Manufacturing Company

BY HAVING substation switchboards shipped completely assembled, the Byllesby Engineering & Management Corporation has effected economies in both time and money. The construction and erection personnel have been able to put these boards into service without any change from the original factory wiring, and with a minimum of erection labor and "proof-testing." Swinging panel switchboards with individual control and relay apparatus mounted on the circuit breaker truck were used so they could be mounted close to the wall and thereby save space.

To avoid the time and labor usually involved in assembling the individual units of a multi-section switchboard, this switchboard was crated, shipped and installed as one unit, making a crate roughly 8 ft. high, 7½ ft. long and 2 ft. thick. Owing to the lighter weight of steel, the total weight, with all instruments and wiring in place, was about 2,400 lb. The channel iron base and the top iron held the fixed panels securely in place, while three temporary cross-pieces of ½ x 1½-in. steel tied the rear flanges of the fixed panels at the point where they are normally fastened to the substation wall. With the swinging panels locked in place by their usual means, this made a very rigid assembly, unaffected by shipping or handling. The switchboard was uncrated near its final location, the cross straps on the rear being removed just before the switchboard was placed in its final location against the wall.



Pre-assembled switchboard partly crated



Moving assembled switchboard into final position

The control and supply buses were installed and tested at the factory with the rest of the switchboard. Heretofore this cross-wiring has been put up in the factory temporarily, in order to accommodate the set-up test, and was then removed for shipment. The erection force was then required to put up a permanent bus as soon as the panels were erected in place, thus in a sense duplicating the work that had already been done in the factory, and requiring further test in order to prove the additional wiring.

With this completely assembled switchboard, the erection force merely had to connect the outgoing control cables to the proper terminal blocks and the board was ready for service.

Cost of Installing Transformer Bank on a Massachusetts System

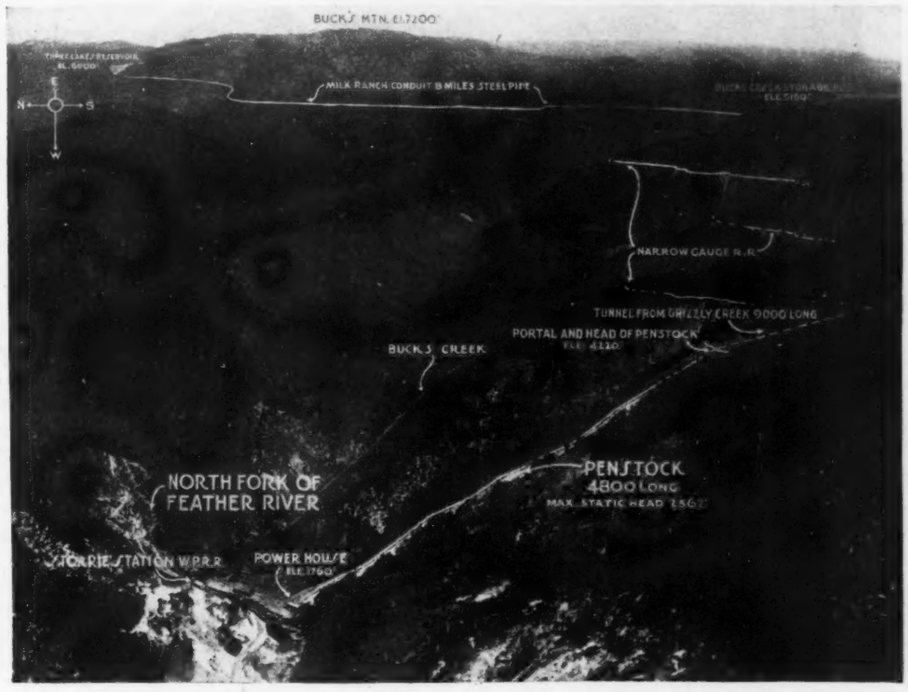
Three 1,000-kva., 13,200/2,300-volt, 60-cycle transformers with trucks, purchased from affiliated property	$3,930.00
Blueprints	0.97
Labor, cutting iron	16.95
Tape, solder, paste, nuts, etc	15.92
20 gal. No. 10 transil oil	6.00
Two current transformers, 600 amp., 7,500 volts	60.00
62 ft. of 500,000-circ.mil, 5,000-volt flame-proof cable	32.86
Transportation costs	411.10
Miscellaneous expenses and supplies	116.85
Miscellaneous labor	458.09
Engineering service	310.00
Total	$5,358.74

2,562-Ft. Head Developed

Required $25,000 per sec.-ft. handled. Penstock subjected to 1,100 lb. per sq.in. near station. Remote control used

WHEN a capital investment of approximately $25,000 is required for every second-foot of water passing through a hydro-electric plant the importance of conserving every drop of water and striving for the highest possible efficiency is paramount in construction and design. Such a plant is that of the Feather River Power Company, known as the Bucks Creek plant, located at the junction of Bucks Creek and the north fork of the Feather River in northern California The plant, which was recently placed in operation, has an installed capacity of 40,000 kw. and required an investment of $7,500,000 to develop a water supply of 300 sec.-ft. under a static head of 2,562 ft. and an effective head of 2,350 ft.

The plant is noteworthy because of its high operating head, being, so far as is known, the highest head plant on the North American continent, exceeding both that of the Big Creek No. 2-A plant of the Southern California Edison Company and the Balch plant of the San Joaquin Light & Power Corporation. In such high head developments great care must be exercised in the design of hydraulic equipment because of the enormous hydrostatic pressures involved. At the Bucks Creek plant the pressure at the power house end of the penstock is 1,100 lb. per square inch, calling for penstock, wye and valve construction capable of withstanding stresses up to 70 per cent of the elastic limit of the steel upon instantaneous closure of valves.


BUCKS MTN. EL. 7200'
MILK RANCH CONDUIT 8 MILES STEEL PIPE
NARROW GAUGE R.R.
TUNNEL FROM GRIZZLY CREEK 9000 LONG
PORTAL AND HEAD OF PENSTOCK
BUCKS CREEK
NORTH FORK OF FEATHER RIVER
PENSTOCK 4800 LONG
POWER HOUSE

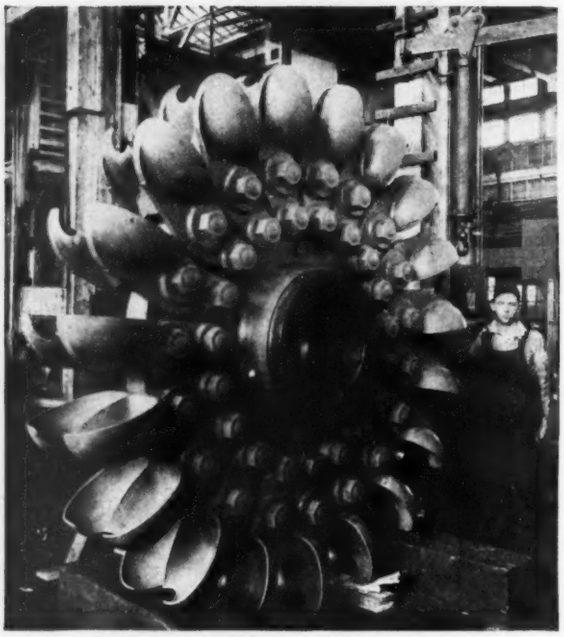
Airplane view of Bucks Creek hydro-electric project showing features

Some of the more important general features of the project are shown in the accompanying diagrammed airplane illustration of the territory in which this extremely high head plant is located.

The project, generally speaking, consists of (1) a main storage reservoir having a capacity of 103,000 acre-ft. and situated in what is known, locally, as Bucks Meadow; (2) a diversion reservoir situated lower down on Bucks Creek from which the waters are diverted through a tunnel and thence into the natural channel of Grizzly Creek; (3) the Milk Ranch conduit and Three Lakes reservoir, the waters from which are regulated in Bucks Creek diversion reservoir; (4) Grizzly Creek forebay, which receives the entire yield of the watershed and diverts it into the pressure tunnel leading to the penstocks; (5) twin penstocks leading down the mountain side to the power house, and (6) the power house and high-tension switchyard. These elements constitute the more important parts of the system.

The two penstocks, which are 4,800 ft. long, consist of 2,100 ft. of triple riveted steel pipe at the upper end, ranging in diameter from 54 to 42 in. and in thickness from $\frac{5}{8}$ to $1\frac{1}{4}$ in. The lower 2,700 ft. of penstock consists of Ferrum banded steel pipe with an inside diameter of 36 in. Water flow is controlled primarily by governor-operated needle nozzles in the power house, although gate valves back of the nozzles are capable of closing against full flow. The motor-operated butterfly valves provided at the upper end of the penstocks are remotely controlled from the power house for closing only. When the penstocks are empty a pressure-regulating device prevents opening of the butterfly valves. With these valves the penstocks can be filled only with 12-in. bypass valves. Other features of similar purpose insure proper operation.

One of the most interesting features of the project is the system devised by which the water level in the forebay is indicated and recorded in the power house and the system of remote control of valves by which the operator can ascertain the position of any of the valves

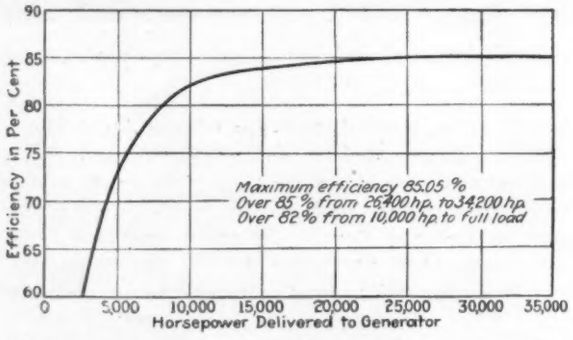


One of the two 17,500-hp. runners for double-overhung water wheel operating under 2,350-ft. head

A feature of the runner is the demountable rim which permits removal of the rim and buckets for repair without removing the hub. The hub is of cast steel and the ring of rolled steel to gain strength at the point of greatest stress.

and can operate them through a number of positions. This arrangement centralizes the responsibility upon the operator for obtaining maximum economy of the use of stored water.

The power house, which is of steel and concrete construction, contains two 35,000-hp., double-overhung Pelton impulse water wheels direct connected to two General Electric 25,000-kva. (20,000-kw.) generators. Efficiency tests on the water wheels made by the Allen salt-velocity method showed a maximum efficiency of 85.05 per cent, as indicated by the accompanying efficiency curve. Separate exciter units are driven by 450-hp. impulse water wheels. Two transformer banks of 25,000 kva. each step up the generator voltage of 11,000 volts



Efficiency curve for 35,000-hp. Pelton impulse water wheel at Bucks Creek plant

to 165,000 volts, for transmission to Brighton substation of the Great Western Power Company at Sacramento. Later the transmission line is to be operated at 240,000 volts.

Originally the Great Western Power Company contracted to take the entire output of the plant, but recently all of the property of the Feather River Company was acquired by Great Western, so that now the Bucks Creek plant adds an important unit to the company's several existing hydro-electric plants on the Feather River.

Views of the penstocks leading to the power house, the generator room and outdoor electrical equipment are shown on page 724.

Staten Island Increases Oil Pressure in Joints

By F. L. Aime
J. G. White Management Corporation

MAINTENANCE of uninterrupted service on an important cable system is the constant aim of any operating force. In Staten Island the cables are highly important, the system is relatively small and the voltage relatively high. One of the details of cable operation, keeping joints and cables filled with oil as well as possible, was changed after some interesting experiments and the details are given here with the hope that they may be of interest to others.

The Staten Island system is one of the six in this country operating 33-kv. cables. They are all three-conductor and to date are all the belted type. Early in 1927 it was decided to change the joints from grease-filled to oil-filled and to attach oil reservoirs to all joints in order to keep the joints filled and thus reduce failures. The reservoirs were installed in March, 1927, and about half the joints are now changed to completely oil filled. This seems to have been the proper cure, for since then the reduction of failures has been highly satisfactory.

The total pressure inside the joint was about 1½ lb. per square inch, obtained from 2 ft. of average height of oil reservoir above the joint and ½ lb. internal pressure obtained by putting a 30-lb. weight on the reservoir, a collapsible type. It was then thought the joint situation was in control, but still there were too many cable failures. The next consideration was that if the oil pressure in the cables could be increased better impregnation would result.

The experiments, conducted by J. J. Burri, superintendent of transmission and distribution, consisted in setting up horizontal lengths of cable 15 ft. long with a regular joint on each one and the end of the joint opposite the cable sealed off. Reservoirs were attached to each joint and weights of 30, 60 and 90 lb. put on different reservoirs numbered one, two and three, respectively. After 30 days no appreciable flow of oil was noticed in the cup at the end of cable No. 1, but a little more was obtained from No. 2. From No. 3, whose joint had the 90-lb. weight, flow had started within 24 hours, and after 30 days about two quarts was obtained at this point.

It was thought the increase in internal pressure, although but 1 lb. per square inch, was sufficient to pass some critical point of frictional resistance by the paper and copper to flow of oil. All reservoirs were equipped with the additional 60-lb. weight. Samples of cable taken from the ducts since that time have shown excellent impregnation near the joints, but sufficient time has not elapsed and not enough data have been obtained to know whether this pressure will be adequate to force oil the entire distance. Manholes are spaced about 350 ft. to 400 ft. apart.

Executive

Responsibility for Accidents*

Improvements in accident records have been made, but railroads have set an example. Economic benefits of more aggressive safety work. Seven suggestions made for further improvement

By K. R. MacKinnon

Chairman N.E.L.A. Accident Prevention Committee

VERY rarely do we find an executive in our industry who will not at least verbally espouse the cause of accident prevention and, at least in a passive manner, give it his support. Most companies have their safety organizations, with their safety meetings and safety directors, and are doing active work along safety lines for the protection of our employees and the public.

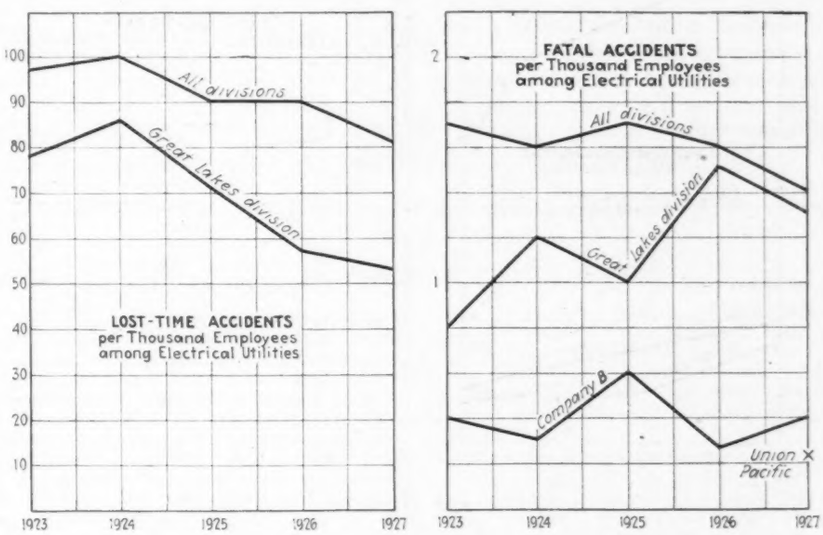
However, there seems to be a feeling on the part of many of our executives and their operating department heads that, having formed a safety department and safety committees, their job is at an end. Accidents still continue with alarming regularity in spite of the precautions taken. We rather complacently sit back and say that ours is a hazardous industry and that a certain number of accidents are bound to occur in such a hazardous industry, that we have taken all the precautions we can think of, and that when accidents do occur in spite of all this it is just too bad.

The careless worker is blamed for almost every accident which occurs and we deplore the fact that our employees, in spite of all the things we have done to protect them, do not take better care to protect their own lives, and in that case the onus of responsibility is on them and not on us.

Are we operating at maximum efficiency? Can anything more be done? Is it worth while trying to do it?"

Statistics on lost-time accidents for the past five years in all divisions of the N.E.L.A. are shown. The Great Lakes division maintains one of the best safety records in our industry and has established a record which other divisions would do well to follow. Lost-time accidents per thousand employees have fallen in all divisions from 98 to 81 in four years. In the Great Lakes Division they have fallen from 78 to 53. The trend in this division is considerably better than the national trend.

A different story is told by the number of fatal accidents per thousand employees. The trend of all divisions is slightly downward, although very slow. It has dropped from 1.7 to 1.4 men killed per thousand employees in four years, while that of the Great Lakes Division has risen from 0.8 to 1.3 in the same length of time. While that division is still below the national average, the trend has been upward to an alarming degree. It would appear that accident prevention activities are making men more careful as to minor injuries, but they are not keeping step with the increased hazards of larger distribution systems and higher voltages.



Lost-time and fatal accidents in electric utilities

Are we operating at maximum efficiency? Can anything more be done? In answer to this question your attention is called to the three lines in the chart which show the accident record of a large company with more than 8,000 employees. It has maintained a splendid record during the last few years. This record is so far in advance of either national or district averages that it is worthy of attention in showing that something more can be done.

Is it worth while? Saving life at any time is worth while. However, in actual practice nearly all welfare work is done on a budget basis with a certain amount each year allotted to it, and when accident prevention is treated purely from a welfare and humanitarian point of

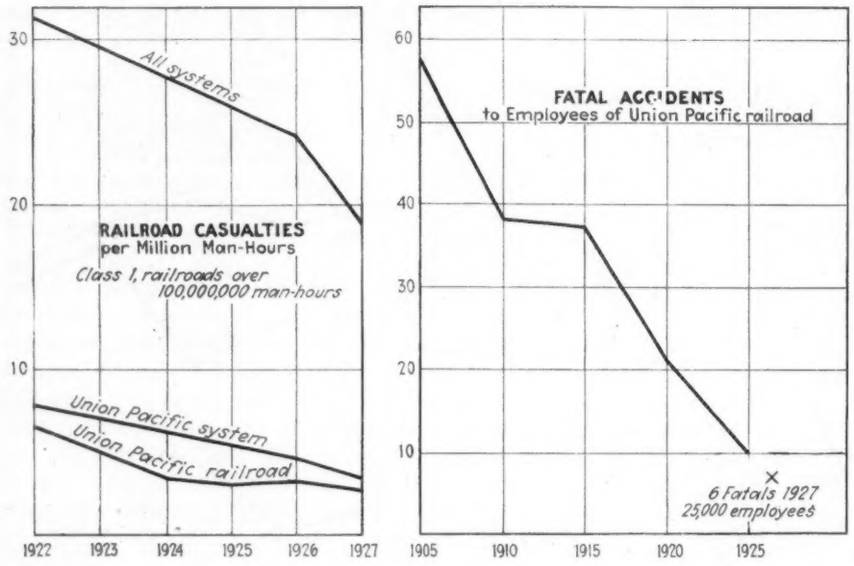
**Excerpts from address before Great Lakes division convention of N.E.L.A.*

view it is apt to be greatly curtailed in its activities and results. The humanitarian aspect of saving these lives is in itself sufficient incentive for almost any expenditure in an effort to prevent their loss, for who can place a monetary value on human life?

However, in the pressure of modern business, and especially in one such as ours, requiring such huge capital expenditures, when accident prevention is treated on a purely humanitarian basis there are many cogs in the intricate machinery of our organizations where individual members of these organizations can throw a monkey wrench, which will nullify to a large extent the efforts of many of those who are most enthusiastic in accident prevention. To overcome this it would appear that this subject must be treated from other viewpoints as well as that of humanitarian.

Where the Designer and Operator Fit In

First of all, designing engineers must design equipment with which our men have to work, with the thought of safety running constantly through their minds. In many cases the cost of extra safety precautions may appear to exceed their value—their value depending largely on the point of view of the designer. Many designing engineers are of the opinion that too many safety "gimcracks," placed on equipment to make it foolproof, will only cause more accidents. Therefore they make simplicity the goal of their design.



Accident records of railroad companies

The field of safety devices is so unlimited and the expenditures which can be made in the interest of safety so great that the designing engineer feels that a heavy burden of responsibility is laid on him in determining just how far he should go. A great deal of progress has been made, but there is still considerable room for improvement.

Operating engineers, through various plant and system superintendents and foremen, must do their work day after day with the thought of safety constantly before them. Many of these men are so interested in the humanitarian aspect of accident prevention that they can obtain maximum results without any further incentive. But unfortunately human nature is such that very many others will not obtain results through those measures alone.

The designing engineer is only one cog in the machinery, but he is a typical one. How can all of the various cogs be reached so that all will respond with a maximum leaning toward safety work, instead of having the good work of some departments blocked by the poor work of others?

Union Pacific Achieves Outstanding Results

To illustrate the point discussed, look at the records of some companies in another public utility industry—the railroads. One chart shows the progress of accident prevention work among the larger railroad systems. The top line shows the reduction in casualties per million man-hours for all class 1 roads of over 100,000,000 man-hours per year, as reported by the Interstate Commerce Commission. These casualties fell from 31 in 1922 to 19 in 1927. Among all these roads the Union Pacific has stood in a class by itself. Its casualties have been reduced from 6.5 to 2.7. The position which this system occupies among other roads of the country in safety work is so pre-eminent that one would naturally inquire as to how it has been able to establish itself in such a position.

It does not take long to find out. If you will mingle among Union Pacific employees, be he a trainman, an office clerk, or a track-layer, it is all the same. They will tell you that the Union Pacific Railroad stands for safety, first, last and always, and that the two most extreme safety advocates in the company are Carl Gray, the president, and William M. Jeffers, the general manager. These two officials have so dominated the minds of the 25,000 employees of the Union Pacific and the 60,000 employees of the system that one of their men recently told me that no matter what sort of a gathering a group of Union Pacific employees may have nowadays, it always ends up in a safety meeting. Those employees are so inspired by their superiors that safety has become a part of their day-to-day religion, and they practise it much more actively than most of us practise our religions.

Humanitarian? Yes. Welfare work? Yes. But two thoughts are also carried out by many of the class 1 railroads. Practically all of these roads have safety organizations, safety committees and safety directors, and yet look at the difference in the results obtained!

When asked the reason for the magnificent showing of their road as compared with others, the safety department of the Union Pacific replies that theirs is practically the only large road in the country where safety work has been assisted by the strongest kind of discipline. By this discipline I do not mean that every time a man has an accident he personally is punished or dismissed. The discipline which is found on the Union Pacific System is a discipline emanating from the president through the general manager, down through the various superintendents of departments, branching out to each and every sub-department down to the final track-laying gang.

What More Can Be Done to Enhance Safety?

1. Let every one in your organization know that you, the head of it, are more interested in accident prevention than any one else in the organization.

2. Let every department head know that you hold him responsible for every accident in his department, and that if he is a good department head he will not have accidents.

3. Have him delegate his authority in such a way that every superintendent and foreman under him will know that he is responsible for accidents occurring among all those working under him.

4. Have your chief engineer feel that you want safe designs for your properties, constructed by safe methods and operated with safety in view at all times.

5. Give full sympathy to the safety department. It can do splendid work along educational and inspirational lines, but do not blame that department alone for accidents that occur. Place responsibility for them on the proper department head and do not do all of your punishing among the workmen

6. Have a full set of accident statistics supplied each month and read them just as you do the financial report. Handle the accidents departmentally, just as you would any other unnecessary preventable expense, and demand their elimination.

7. Every month have each department head explain personally the cause of each accident in his department the previous month, advising what he has done to prevent similar accidents in the future.

The general manager holds each department head under him personally responsible for all accidents in his department. This responsibility is handed down through the various sub-departments and this discipline is enforced rigidly throughout the whole system. It is part of the working religion of the Union Pacific Railroad that accidents must not occur on that road. Superintendents and foremen are not only held responsible, but are actually punished for accidents in their departments.

To the safety man who believes in safety only from a humanitarian standpoint this may seem a little bit harsh, but the fact is it get results, and the other railroads that have not adopted these methods are not getting results anywhere near those obtained by this method.

For many years the United States Steel Corporation has operated along the same disciplinary lines as the Union Pacific System, with the same splendid results. The late Judge Gary dominated the Steel Corporation in the same way that Mr. Gray dominates the Union Pacific System. He demanded results and then saw that he got them. The results which he obtained were really phenomenal. For instance, the Duluth, Missabe & Northern Railroad, a subsidiary of the Steel Corporation, with an accumulated exposure of more than 20,000,000 man-hours, in three years operated without a fatal accident. The Duluth & Iron Range Railroad, also a subsidiary, has operated more than two years without a fatal accident

Why do they strive so hard for these splendid safety records? It is because they look on it as just plain good business, and they treat it as a very important part of their business. If it is good business for the railroads, it is also good business for the electrical industry.

Benefits to Be Derived from Accident Prevention

1. Better Employee Relations.

When our employees feel that we are taking a deep personal interest in their safety and welfare they have a better feeling toward their employing company, and we have recognized for many years that good employee relations are a very important part of our business.

2. Better Public Relations.

These follow first after better employee relations because we are learning, as time goes on, that whereas it is important to have a good public policy and a good director of public relations, the real contacts between ourselves and our public are made by our employees, and it is those contacts which stick in the minds of the public. Each employee has a circle of friends, and if he is a booster for his company to that circle of friends the good will of the company is spread to a very large number of individuals; this in addition to the contacts which are made in a purely business way.

3. Better Service.

Lack of continuity of service is perhaps one of the quickest ways to endanger one's public relations. Preventable accidents are responsible for a vast number of outages on our systems which breed bad will among our customers and which cost us revenue.

A few years ago a case occurred where some careless lineman dropped a primary wire into a secondary circuit, which did considerable damage to lighting fixtures in a number of houses near by. The alarmed occupants of the houses rushed out in great fear after seeing some of their lighting fixtures sputter, sparks burning holes in their rugs and table cloths. They were greeted by a loud laugh from the men up the pole, who looked on it as a huge joke. The attitude of the men at the damage done, together with the service outage, caused a great deal of bad will in that neighborhood which lasted for some considerable time.

This is only one example of what can be done by employees who have the frame of mind shown by this incident. There had been no active accident prevention work done in that company at that time. Today, with a different atmosphere and different feeling between the employees and the company, such an occurrence would be impossible.

4. Increase in Net Revenue.

Accident prevention not only prevents many serious service outages which cost our industry a large amount of revenue, but the accidents themselves are very much more expensive than most of our executives imagine. The Travelers' Insurance Company, after a detailed examination of some 5,000 cases of accidents in industry, has found that the "hidden costs" of accidents are about four times the actual costs as shown by compensation payments.

An estimate made on the basis of the 1927 accidents of our industry, and applying the Travelers' ratio, indicates that accidents cost our industry, in that year, some $20,000,000. Those of you who have come in direct contact with the operating force of a company after a serious accident will realize what is meant by "hidden costs." For instance, after a lineman has been killed, the time which is spent talking about the accident by the other linemen and groundmen is no inconsiderable item. The lack of efficiency in their work for many days thereafter is a very noticeable feature, and incidentally a very expensive one, because it is a group action. If the men think that the accident was due to the lack of provision of proper equipment by the company, or by improper methods of work, their efficiency will be lowered for a very long period of time. The "overhead" cost of accidents by actual proof is extremely high and results in a very serious decrease in our net revenue.

Erection and Maintenance

By N. L. Rea,
Contract Service Department, General Electric Company

ERECTION and maintenance are more closely related than many realize; in fact, they are twins. Erection is the launching of the ship and maintenance is the seamanship that keeps her well found for a long and useful life. The finest kind of maintenance cannot overcome a poor job of erection. A bungled job of launching may sink a ship before she can ever carry sail or cargo. The best erected equipment will have a short and hectic life without maintenance, and a combination of poor erection and no maintenance is worse than throwing good money out of the window.

A good erector should have skill, common sense and special knowledge of the apparatus he is erecting. Some owners apparently believe that any unskilled person can erect electrical equipment. The result is often a sad or disastrous experience.

It is impossible to write instruction books so complete and detailed that a man cannot make a mistake in assembly and erection. The best that can be done is to assume that the erector will be a good mechanic and then to give him general advice and any special instructions necessary. You can tell a man to scrape bearings when necessary, but you cannot impart the skill and judgment he will need in deciding what to do and when to do it. Experience and training under older and more experienced men are the only ways that good erectors are made. If the student hasn't good "horse sense" and willingness to take and profit by instruction you are throwing away time and money on him.

Instruction Books Important

On the other hand, no erector knows so much that he does not need to read and follow carefully the instructions sent with the apparatus. I have traveled several hundred miles on a complaint of hot bearings on a waste-packed induction motor. Several good mechanics had failed to solve the problem and get the motor to run. Yes, they had plenty of instruction books, they said; one had come with every motor. But they had not bothered to read them. They were surprised when I showed them this statement in the booklet: "This motor is intended to run with the belt pull to the right when facing the pulley. If the belt pull is to be to the left, the bearings must be turned in their housings and repacked, proceeding as follows . . ."

The belt pull was to the left, and they had an effective bearing length of about one inch instead of five. Polishing a scarred shaft and refitting the bearings were necessary. Naturally, the heating was eliminated when the instructions were carried out.

Granting that equipment is installed properly, it should be taken care of, and to do this an effective system of maintenance is necessary. There is nothing like a regular schedule for producing good results. Some record should be kept of the history of every motor-generator, for instance. This may be in the form of a record card or log book. It should be some one's business to check each piece of equipment at certain definite intervals and make proper entries of his findings on the record. The frequency of these inspections must be governed by the operating conditions, the size of the equipment, and its importance. Once an hour, once a day, once a week, or once a month may be none too often. The important thing is regularity, and a complete record, signed by the inspector. Then when trouble develops it will be possible to remedy it in the shortest time.

The points to be checked can be varied to suit local conditions, ranging from a few items to a complete report. The fundamentals are:

Bearings—Oil level; date of oil change; operation of oil rings or other oiling device; temperatures.

Insulation—Condition, clean or dirty; evidence of oil throwing; date cleaned; resistance to ground.

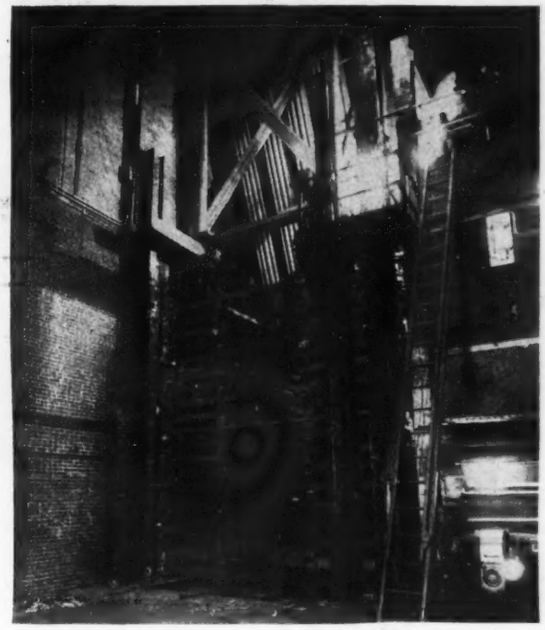
Other items can be added as necessary. Bearings and cleanliness are of chief importance. A machine should be kept clean inside and out. Keeping dirt from getting in makes a good start. We have found motors nearly buried with shelled corn, cement dust, rags, or trash. Others, spotless on the outside, were full of dirt inside where it didn't show. One owner requested some paint to protect the windings and field of a synchronous motor. The bolt heads and other projections on the machine were being eaten away by particles drawn or thrown into the motor. Our advice was to find the source of the abrasive and stop it. Prevention is, of course, better than cure, and is usually possible. A clean machine gives the best service. Periodic measurement of resistance to ground will give an indication of any change in the insulation and perhaps forestall a complete burnout.

The main things are intelligent erection and care and a conviction that the manufacturer had a well-founded purpose in issuing his instruction books.

Motor-Driven Pipe Cutter Speeds Installation

IN WIRING the new chemical laboratory of Harvard University, Cambridge, Mass., the Hixon Electric Company, Boston, utilized a Toledo motor-driven pipe-cutting, threading and reaming machine as shown above. This outfit will handle pipe up to 2 in. in diameter and it will cut a thread per minute, working seven times faster than the previous hand method.

Sixty-Ton Boiler Raised 19 Ft. Without Accident



Boiler supported by cradle and cribbing during raising process

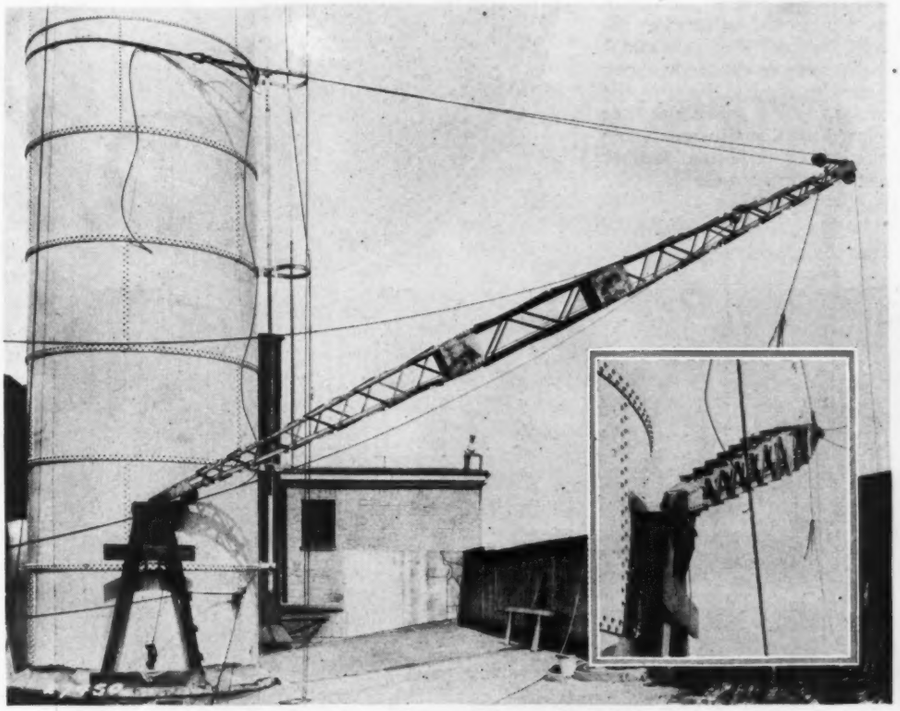
TO ENABLE coke breeze to be burned in the generating station of the Fitchburg (Mass.) Gas & Electric Light Company it became necessary to raise a 500-hp. Bigelow-Hornsby water tube boiler 19 ft. 3 in. on account of the space requirements of the furnace. Without water the boiler weighed about 60 tons. The instructions given for the work were as follows: (1) Remove brickwork; (2) remove Taylor stoker; (3) remove steam piping for soot blowers and blow-off lines; (4) build wooden cradle (14 in. x 14 in., and 12-in. x 12-in. framing with 3-in. x 10-in. cross bracing) to carry boiler tubes and drum during jacking up process; (5) remove former steel columns; (6) jack up boiler on 6-in. x 6-in. hard pine cribbing, using three cribs at rear and two in front, and requiring twenty 5-ton building movers' jacks; (7) build foundation of quick-setting cement for new rear columns; (8) erect new columns; (9) attach boiler to new steelwork; (10) dismantle wooden cradle; (11) remove cribbing; (12) build remainder of foundation for walls and stoker; (13) install Harrington stoker; (14) install brickwork and Bigelow air-cooled arch and air-cooled front wall; (15) reconnect piping and instruments; (16 dry out for two weeks with slow fire of anthracite coal; (17) resume operation.

The jacking up took thirteen nine-hour days and required four men and a foreman. The work was done by a rigging contractor under the supervision of R. F. McDonald, resident engineer, and G. R. Wood, consulting engineer, of the engineering department of Charles H. Tenney & Company, Boston, managers of the Fitchburg company. No accident occurred during the job.

Stacks Rebuilt Economically

AN ECONOMICAL and unusual method was used in handling the steel plates for the replacement of four 125-ft. stacks at the Chester (Pa.) station of the Delaware County Electric Company. The plates had to be raised from the ground floor level to the base of the stacks on the boiler house roof, a total height of 120 ft. Normally this method would be accomplished by means of a stiff-leg derrick erected on the roof. However, instead of this a Chicago boom, 50 ft. in length, was anchored to the base of one of the present stacks by means of a steel plate and tap bolts, as shown in the illustration. This stack was then cut down within 15 ft. of the roof level. The boom was then moved to another stack, located near the parapet, and the remainder of the first stack cut into sections and lowered to the ground. This stack was then rebuilt and the boom moved to this stack, where it remained for the dismantling and erection of the three remaining stacks. Moving the boom from one stack to the other took about four hours.

In employing this method a saving of approximately $1,200 was made, which would have been the additional expense involved in the erection and dismantling of a stiff-leg derrick, the cribbing required to raise the derrick to the top of the parapet and cutting openings in roof slab to anchor the derrick in place.

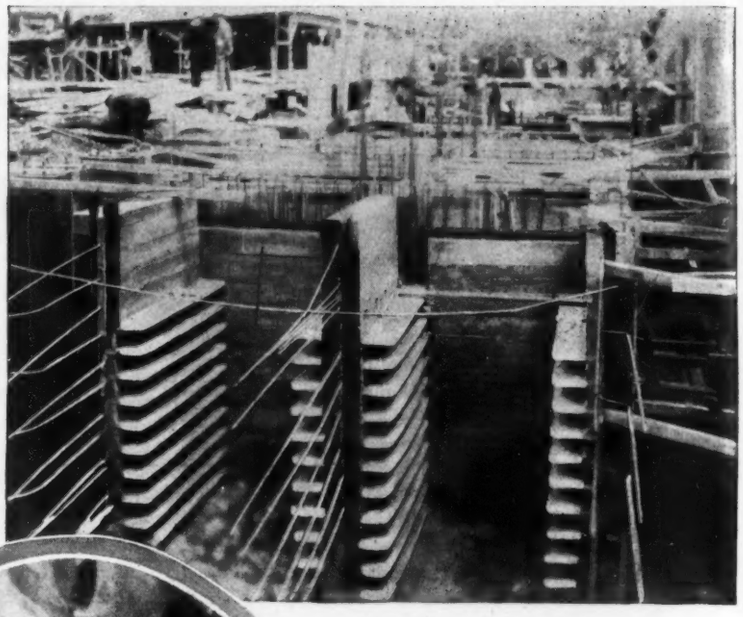


Erection work simplified by use of Chicago boom

Precast Slabs Simplify Vault Construction

THE all-concrete underground cable vault for the outgoing 13.2-kv. feeders at the Westmoreland substation of the Philadelphia Electric Company involves several construction economies. The shelves for supporting the cables were made up of concrete precast slabs 2 in. x 15 in. x 30 in., reinforced with 2½ in. diameter mesh "steelcrete." Installation was planned along labor-saving lines.

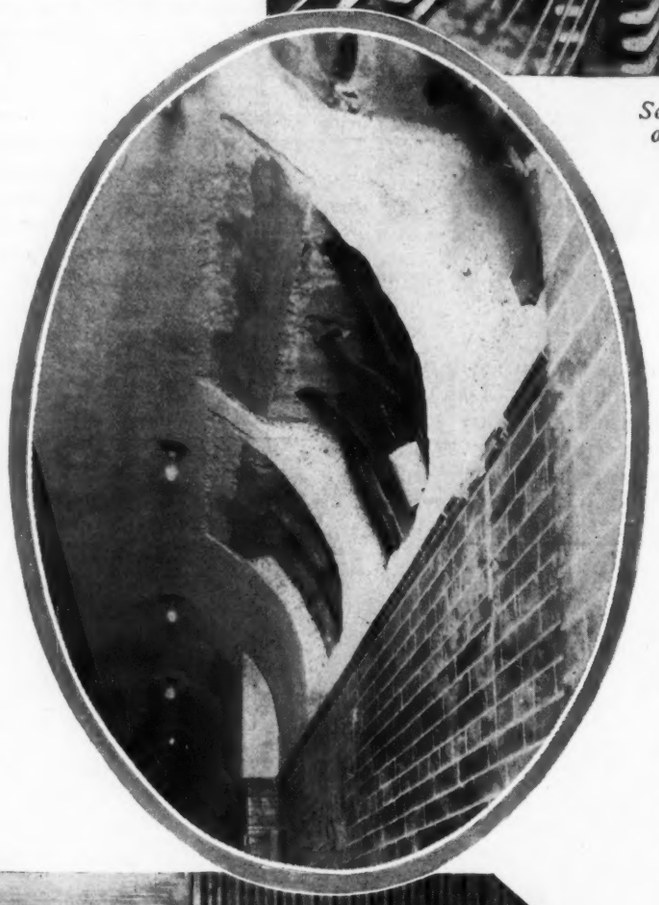
These slabs were made in a special form, each form containing 60 slabs, a total of four forms being used. The forms were so constructed that they could readily be reused in order to make the total of 5,580 slabs (approximately 2¾ miles) required for the entire vault. These slabs or concrete shelves, which project into the main walls 4 in., were set in the form work for the main walls, held in place by cleats and spreaders, and the wall then poured. After the walls were stripped and rubbed down the only operation to complete was the installation of terra-cotta duct and cable and, of course, the roof slab. Ordinary practice would be to form the main walls, set wood keys in place for the shelves and then pour the walls. After the walls and keys were stripped the precast slabs would be set in place and then grouted.



Setting of slabs and pouring of main walls performed in one operation

[In Oval]

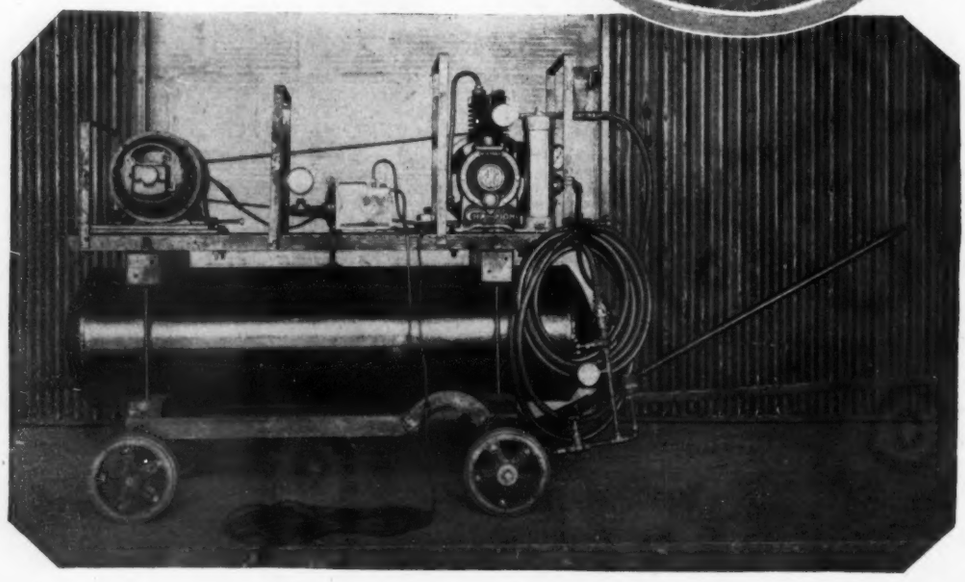
PULL BOXES in the walls adjacent to the ceilings avoid the sharp curvature which would otherwise result where the horizontal cable runs in the floor above join the vertical ducts in the walls. The openings are closed with easily removable panels of asbestos lumber set in iron frames.



Man-Hours Saved Checking Gaskets

THE tightness of gaskets on subway transformers, junction boxes, network protectors and similar equipment on the system of the Puget Sound Power & Light Company is checked by pumping air into the equipment with a portable compressor. An automatic pressure switch starts and stops the compressor motor and a safety valve acts if the switch fails. Air for testing first passes through a filter to remove water, oil, etc., and then through a pressure-regulating valve that maintains constant pressure in the hose line.

Formerly it took three men using hand pumps one day to test all subway transformers, switches and junction boxes in a transformer vault, according to C. H. Hoge, construction superintendent of the distribution department. Now with the portable air compressor this work can be done by two men in about two hours.



Portable compressor permits checking tightness of gaskets on subway equipment with about one-eighth the former labor

Selling Industrial Equipment

to Power Customers

Advantages gained by the central-station company through the specification and sale of industrial electrical apparatus. Objections to this practice analyzed and answered

By Roy Thurman

Indianapolis Power & Light Company, Indianapolis, Ind.

SHALL the electric service companies merchandise motors, industrial heating equipment and other power-consuming devices, or shall they refuse to have anything to do with the marketing of the equipment needed by their customers in using the power furnished by them? Each side of the foregoing question has its strong advocates, and of course they are firmly convinced that theirs is the only correct answer. Many arguments have been brought up to support both views, but the old proverb that "the proof of the pudding is in the eating" still holds true, and it will have to be admitted that the strongest proponents of the negative side are those who have never tried the other method, or have gone at it in a half-hearted way without the proper set-up, while those who have enthusiastically pushed the sale of equipment with trained men agree that this is one of the most important factors in their success in getting power business.

Objections Analyzed

It may be well first to look at the objections that usually are put forth as reasons for not selling industrial power-using equipment.

Not Enough Profit—It is true that the margin of profit on this class of merchandise is very small in percentage, but the amount of money involved is usually large, so that the net in dollars is well worth while. It is, however, not enough to warrant a special sales force or an advertising campaign, but since virtually all central-station companies have their power salesmen, and little additional time is required to sell the equipment after the power program is sold, the difference between cost and selling price, less handling charges, is all net profit. Selling of this type must be specialized, so that a general advertising program is not necessary. Then the fact that the per cent profit is small makes it impossible for a dealer, who has to depend on merchandising profit alone, to do an adequate job of selling, while the central station continues to profit for years to come from the power used through the device.

Difficulty in Handling.—This is a distinct disadvantage with many companies because of the red tape connected with purchasing, handling and selling anything. In too many organizations the accounting department has control of the purchasing and stores divisions, and they have surrounded the simplest business transaction with so many rules, regulations and orders that oftentimes the delays caused by this mass of routine make it impossible to give any reasonably prompt service to the customer. In such cases, naturally, the customer prefers to place orders for his needs where it is unnecessary to have it approved by several officials in various parts of the country before giving it to the manufacturer. The solution is obvious. Either provide a short cut through the red tape or organize a separate merchandising plan for this class of apparatus. Either way will be satisfactory so long as it allows prompt delivery to the customer, for that is the thing in which he is interested.

Servicing Obligations.—The problem of servicing industrial power equipment is of very minor importance, providing the central-station company is careful to see that the manufacturer of the product sold is both morally and financially responsible. The standards upheld in modern manufacturing businesses require that the user must be satisfied with his purchase, and that this satisfaction must be maintained over the life of the equipment. The sales engineers of the central-station companies then are merely the representatives of the customer in transmitting to the manufacturer any complaints regarding his equipment, and seeing that they are satisfactorily settled.

Satisfactory Service Is Vital

Responsibility for Successful Operation.—This excuse for not handling this class of apparatus was given by a prominent central-station sales executive recently at a meeting where the same man was advocating the layout and sale of substation equipment to customers by power engineers. This position seems rather illogical when one considers that it requires more skill, experience and engineering knowledge in planning substation layouts than it does in figuring the application of motors to power-driven machinery. With the practically universal use of motors in connection with all kinds of machines, the manufacturers have developed the complete data needed, so that it is a comparatively simple matter for a competent engineer to apply any electrical device without fear of unsatisfactory operation.

As a protection to its own business, the central station should see to it that the customer has satisfactory service from electrical equipment, for too many times an overeager salesman, on a commission basis, sells perfectly good equipment that is not fitted for the particular job required of it. The result is that the customer condemns the use of electric service, not only for this one application but perhaps for many others.

Possible Loss Due to Bad Accounts.—The central-station company is selling electric service to these same customers and is in a much better position to collect for any material sold than any other dealer. Of course, the usual restrictions regarding credit should be observed in

this as in all other cases where credit is allowed. The class of customer to whom this type of product is sold is usually considerably above the average financial standing, and even a smaller percentage of loss should occur than with other accounts.

The Customer Will Buy Anyway.—The contention is that motors in particular are so standardized at present that the customer buys them the same as other plant equipment. This may be true in the case of large organizations, where well-trained engineers specify the correct apparatus to be purchased and take into account the quality and adaptability as well as price. It is, however, a distinct advantage to the central station to have a customer purchase the very best quality of material and of capacity best suited to his needs, in order that he may have satisfactory performance, and thereby the most efficient use of the service which the central station sells, year after year.

A Worn-Out Argument

Enmity of Other Manufacturers.—This seems to be the real reason for the negative attitude of many executives on this question. They admit that it is not advisable to distribute sales effort over several different brands, and that only one make of equipment should be sold to get the maximum results. This makes them fearful that competitors of the line they handle will fight them with isolated plant propaganda, and they wish to buy their freedom from this threat by an appearance of neutrality.

This supposed attitude on the part of the manufacturer whose product is not being handled is largely imaginary. There is not a reputable manufacturer in business today who will countenance a semblance of the action mentioned. Some mentally crippled salesman may intimate some such possibility, but it is purely a bluff, for he knows that his concern will not support him in this type of blackmail. Then, too, the manufacturer undoubtedly has his share of central-station customers and is very careful to avoid acquiring a reputation for unethical practices. Some sales representatives demand what they call their "share of the business" where the service company even buys for its own use. Their excuse is that since their company is in the electrical business they should be given a part of all purchases, regardless of price, quality or service rendered. They maintain that their efforts must be recognized to enable them to hold the bids of their successful competitor at a minimum. Under modern conditions, this claim is so absurd that it should not be necessary to state it, yet it has its effect on those who still think that competition is needed to get fair treatment in every business but their own.

Many of the same companies that refuse to take advantage of the benefits derived from selling power equipment for the reason just mentioned illogically handle one line of electric ranges, electric refrigerators, washing machines, etc., and think nothing of it.

Other Advantages to the Utility

In setting forth the fallacies of the principal objections to selling several of the advantages have been brought out, but there are still several important points that should not be overlooked.

Pioneering New Developments.—The rapid advance of the entire electrical industry makes it impossible for anyone who is not directly involved to keep up with the many new uses of electric service being developed almost daily. Therefore, it devolves upon the central-station sales engineers to educate their customers along this line and assist the manufacturer in marketing new uses for his product, for the service company stands to gain far more than the manufacturer.

Have Knowledge of Load Increases—If motors or other equipment are not sold by the utility, the customer is apt to add to his load until he is either getting poor service or has a shutdown because of burned-out transformers. Where the utility handles this equipment, even though the order may not be placed with it, the contemplated increase will be known and can be provided for in advance.

Customer Should Have Best Equipment.—It is important to the power company to have its customers use the electric power sold to them in the most efficient way and with as little trouble as possible. There are a number of manufacturers of power equipment who are reliable and will back up their products 100 per cent. The utility executive knows these, and if one of them is selected to furnish the apparatus to sell to the customers of the company he can be sure that no criticism will accrue in the use of electric service through that product. The old saying that "a satisfied customer is the best advertisement" is as potent in the sale of kilowatt-hours as it is in any other line of merchandise, and in case of unsatisfactory performance of the equipment there is a possibility that the blame will be placed on the use of electric power instead of where it belongs; that is, on unsuitable or cheaply built apparatus.

Maintain Contact with Customer.—At present, when good public relations problems are occupying such an important place in the thoughts of the leaders of the industry, the fact that by selling power equipment more friendly and closer relations between the utility and the customer are built up and maintained should be reason enough for very serious consideration of this phase of the question.

With companies where the sale of industrial equipment is taboo the power customer often goes from one year's end to the next without contact with the utility other than receiving a monthly bill. All progressive power users have from time to time need for additional power equipment, and this provides an opportunity for the power salesman to sell his company, as well as his motors. To the customer the sales engineer is the company. When the customer thinks of the utility company as a huge, impersonalized corporation it is easy for any insignificant or fancied injustice to find lodging in his mind and be magnified out of all proportion to its importance. The salesman's frequent contact personalizes the company and largely eliminates the likelihood of a customer harboring unjust prejudices.

Better Public Relations

It also makes it possible in many cases for the salesman to help the customer solve his electrical problems, and that is certainly appreciated. In most communities the manufacturer is a leader in molding public opinion, and the kindly feeling engendered by frequent friendly visits of the company representative will have its effect upon the attitude of the community toward the utility company.

The Power Salesman.—The entire success or failure in selling power equipment, as well as kilowatt-hours, depends almost wholly upon the type of men who are doing the selling. The power man should, first of all, be a practical electrical engineer with considerable knowledge of mechanical and chemical engineering principles.

With this basis, he can solve his prospective customers' engineering problems, can help in cases of emergency in electrical or mechanical trouble, can advise regarding plans for installation of additional equipment, including wiring, switchboards, etc. If he is able to satisfy the customer in these respects he will quickly build up confidence and good will, so that it will be comparatively easy to introduce new equipment and new uses for the product he is merchandising.

Requirements of Power Salesmen

It is imperative that the power engineer have a pleasing personality so that he may become favorably known, not only to the executives of the various industries but also to the foremen, electricians and other men who operate electrical or mechanical equipment through which he sells his power.

In addition to this, he should also be well acquainted with the operating conditions of the central station, including plants, lines, substations, etc., and have a good working knowledge of the rate schedules of his own and other companies. He must realize that it is impossible to get all of the power business in his territory for his company because of the conditions surrounding certain industries requiring large amounts of steam. He should understand that it is of the greatest importance in making recommendations to customers that an absolutely honest and fair report be submitted even though at times it will show that the utility cannot always furnish service. He must remember that he is responsible to a large extent for the attitude of the customer toward the company, and his service to the customer will determine whether or not it is enthusiastically favorable or fanatically hostile. In bringing about the desired result it is agreed by those who have experimented that the sale of power equipment is of real assistance.

Constant Line Regulation with Variable Power Factor

By C. O. von Dannenburg
Electric Management & Engineering Corporation

With a constant kilovolt-ampere load the regulation of any circuit will depend upon the size of the conductor, the arrangement and spacing of the conductors and the material of which the conductor is made. The actual regulation will vary with the variation in power factor, depending on the relation of the inductance to the resistance component of the circuit, although one usually considers in the average circuit that the regulation will be poorer at the lower power factors.

The writer recently had occasion to investigate an instance in which two circuits of different materials had been operated in parallel, and in the consideration of the necessity for installing regulating equipment at the sending end calculations and actual tests indicated some which were somewhat interesting.

The actual circuits operate at 37 kv. at the sending end and are three phase, 60 cycle; one circuit is made up of No. 4 A.W.C. copper conductor 19 miles long having calculated electrical characteristics of 26.6 + J 14; the other circuit consists of No. 3/0 A.C.S.R., 22.75 miles long with calculated electrical characteristics of 13.3 + J 16.6. The calculated characteristics of the combined circuits are 9.52 +J 8.43.

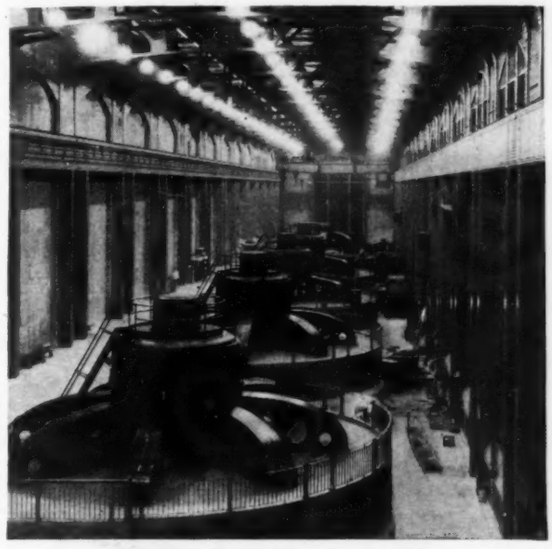
For the combined circuits the calculated regulation, which checked very closely with the actual results by test, are:

Power Factor, per Cent		Regulation, per Cent	
100	70	3.5	4.7
80	0	4.7	3.1

The foregoing tests are based on a 5,000-kva. load and of course other load regulations could be obtained by proportion. The values given cover the extreme values, all other power factors giving intermediate values. The reason for this result is obviously due to the fact that the resistance and inductive values are practically the same; the fact that the resistance factor is higher gives a higher regulation value at 100 per cent than at zero per cent power factor, although from a practical point of view the regulation through the whole range is virtually constant. The results obtained suggest further possibilities if the principles are applied to existing circuits.

8-11 Ft.-Candles in Conowingo Generator Room

In the zone of operating activities the intensity of illumination in the generating room of the Conowingo station ranges from 8 to 11 ft.-candles. The uniformity of lighting is indicated by the absence of shadows. The generating room is 615 ft. long by 72 ft. wide by about 60 ft. high and contains 102 lighting units installed above



Operators receive ample light in this station

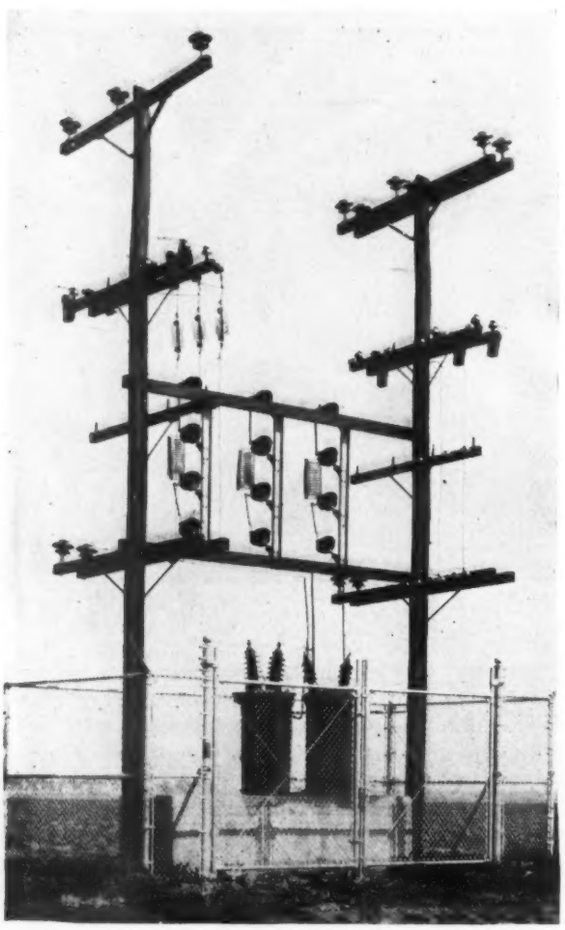
the craneway. Although the installation has been wired for 1,000-watt units, the initial equipment is of 500-watt gas-filled lamps mounted in Holophane No. 661 high-bay reflectors on the basis of twelve lamps per 72-ft. bay. One-fourth of these lamps are wired for operation in emergencies from a direct-current service supplied by the control battery installation, though normally all lamps are on alternating-current service. The bays are fed by two-wire circuits in rotation from the three phases of the lighting mains, a control cabinet being provided for each bay. The lighting system was designed and installed by Stone & Webster, Inc., Boston, designing and constructing engineers for the power plant project.

Discharge from the well

Experimenting with Irrigation in the Middle West

IRRIGATION has not been an important factor in agriculture in the prairie states, the gentle rains being relied upon to quicken and nurture the tender seed. But in the Platte Valley in Nebraska efforts are being made to introduce pump irrigation. An experimental installation of this kind has been made on the Brown experimental farm, 2 miles west of Gibbon, Neb., by the Central Power Company and the Kelley Well Company, Grand Island, Neb., and the Pomona Manufacturing Company, Pomona, Calif.

The well on which the experiments are being conducted is 58 ft. deep and contains about 45 ft. of water. The pump, which is of the deep-well turbine type, is driven at 1,150 r.p.m. by a 10-hp. motor built into the well head. A test showed a discharge of 1,239 g.p.m. with the motor developing $8\frac{3}{4}$ hp. This well is being closely watched by the farmers in the territory, and if the equipment continues to show the present good results it will do much to further the development of pump irrigation of prairie lands and, incidentally, provide a very worth-while load for power companies in the region, particularly during the summer months.



Central Power Company substation serving experimental pump irrigation installation

C. F. Stuart Optimistic on Farm Business

WHILE Pennsylvania has established a record in extending rural lines and providing facilities for handling applications and complaints, other parts of the country have concentrated more on building the energy usage per customer, declared C. F. Stuart, Northern States Power Company, recently before Pennsylvania utility men. In Minnesota a consumption of 1,200 kw.-hr. per year per rural customer is considered an economical minimum and 32 farms that are not playthings of rich men use 3,000 to 20,000 kw.-hr. per year. Similar figures were reported for Missouri, Kansas and Nebraska farms. Fifteen in Pennsylvania use more than 3,000 and one consumes 29,000 kw.-hr.

With 200 proved practical uses for electricity on the farm there is no longer excuse for a customer consumption of 25 kw.-hr. per month, Mr. Stuart contended. The best satisfied customers are those who use the most energy. Complaints come chiefly from customers using 300-kw.-hr. or less. Attention was called to a pamphlet which the University of Minnesota is about to issue giving extensive data on the economy of various farm applications. On five electrified farms the gross revenue increased 42.9 per cent, operating expenses only 1 per cent and net earnings 81 per cent. Allowing for fixed charges a net increase of 50.9 per cent for the five farms was obtained.

Any company that can't work out a rate that will interest farmers and pay utilities on 1,200 kw.-hr. per year per customer has only itself to blame, contended Mr. Stuart.

To build farm load, he recommended establishment of rural-service departments in each utility, active executive support, distribution of data from C.R.E.A., Vol. 4, No. 1, among farmers and contractors, distribution of "Electricity on Farm" among farmers, use of demonstration trucks, schoolhouse meetings, demonstration farms and fair exhibits, and placing equipment on trial. While the latter practice may appear hazardous, 39 out of 40 ensilage cutters and thirteen out of 22 portable motors thus placed were sold in two instances. In another case only four out of 1,000 pieces of equipment placed on trial were returned. Basing his judgment on the last five years' experience, Mr. Stuart anticipates that a 100 per cent increase in farm electrification may be expected in the next five years.

Investment-Management Firm Takes the Stage

Allied Power & Light is a consolidation of closely related public utility management, engineering and construction groups. No radical departure in function

Based on an Interview with
R. P. STEVENS
President Allied Power & Light

R. P. Stevens

LAUNCHED a few months ago under the rather uninforming caption—utility management and investment companies merge—a new corporate alignment of old-established utility concerns has adjusted itself into the ever-changing utility picture. The announcement of new mergers and consolidations is a frequent occurrence, but there are those who see in this new consolidation, which assumed the title of Allied Power & Light, another Electric Bond & Share Company in the making. The principal constituent units were Hodenpyl, Hardy & Company, Inc., Stevens & Wood, Inc., and interests which were affiliated with Bonbright & Company.

Approached with the very pertinent question, Why did these companies consolidate? R. P. Stevens, president of the new organization, told us a few of the intimate details which do not appear from the stereotyped terminology of the typical banking circular. The group of companies involved had become closely associated in their business. Furthermore, they had all acquired substantial holdings in a group of Eastern and Middle Western utilities. One member of the group, Hodenpyl, Hardy, Inc., lacked engineering and construction departments, while it had seasoned management facilities. Stevens & Wood, Inc., had a well-developed engineering and construction department. The Bonbright interests were involved exclusively from the investment standpoint. With this background the *raison d'être* for a merging of interests begins to appear.

Background of Constituent Elements

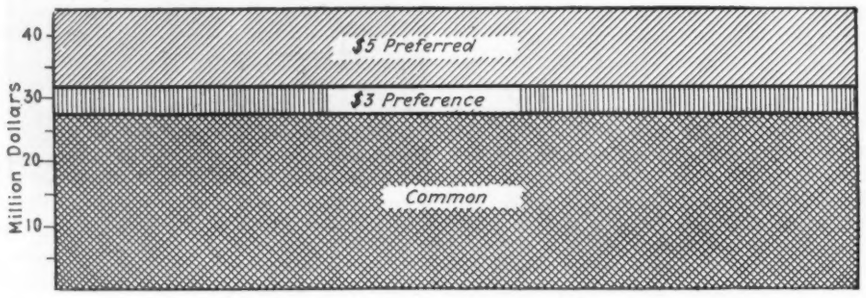
The answer to "Why the merger" becomes more apparent from a glance at the background of the companies concerned. Hodenpyl, Hardy & Company and their predecessors for more than thirty years had been interested in the organization, development and operation of public utility properties. They were among the pioneers in the development of the holding company plan of diversifying utility interests, the development of hydro-electric plants, the long-distance transmission of electricity by high-tension lines and in the distribution of securities to customers. Many of the properties which they developed are now successful component parts of the Commonwealth Power Corporation system, in which Allied Power & Light will have substantial holdings.

The Stevens & Wood background in the utility field is similar in certain respects. For many years this company and its predecessors had engaged in general engineering and construction business and had managed, supervised and financed the activities of numerous public utility corporations. They have also to their credit some large engineering undertakings in the industrial field. One might mention among their important power house undertakings at the moment the Toronto station of the Ohio River Edison Company, the Fairbanks (Alaska) power station for the United States Smelting, Refining & Mining Company and the design and construction of the new Deepwater power station at Wilmington, Del., for the American Gas & Electric Company and the United Gas Improvement Company, which is to be used jointly by these companies and also to supply process steam to E. I. du Pont de Nemours & Company. This latter, incidentally, is the first new station to be designed for 1,200 lb. steam pressure. Stevens & Wood, Inc., will retain its present identity and personnel and will continue to function in the capacity of consulting engineers.

This brief review of the background of the two companies throws light on the function and business of the Allied Power & Light Company, since, according to Mr. Stevens, there is to be no radical departure from the functions and operations of the constitutent elements. The new organization has now been in operation since May of this year and has been carrying on its work in connection with existing engineering and management contracts as well as accepting new ones. Furthermore, it has acquired and is holding minority interests in its group of associated utilities, including Commonwealth Power Corporation, Penn-Ohio Edison Company, Northern Ohio Power Company and other power and light systems. Allied Power & Light does not control a single utility, and, presumably, does not intend to. It extends its services both to associated companies and to outside organizations. It is prepared to supply the necessary capital and direction for the reorganization or consolidation of power and light properties in addition to its engineering and construction function.

While the property development function of the old Hodenpyl, Hardy organization will be a function of the new enterprise, as already stated, neither Mr. Hardy nor Mr. Hodenpyl will actively participate in the affairs of Allied Power & Light Company, although Mr. Hardy remains as director of the Commonwealth Power Company. The business, assets and contracts of Hodenpyl, Hardy & Company were acquired *in toto* by the new organization, and Hodenpyl, Hardy has been dissolved. Stevens & Wood, Inc., continues as an entity, subsidiary to Allied Power & Light, but retains its personnel and individuality, and, incidentally, has received some attractive contracts since the merger.

Turning to the question of personnel, from the Stevens & Wood organization the new company obtained Mr. Stevens as president, and he continues as chairman of the board of the old company, of which Mr. Sawyer



Capital set-up based on market quotations about Oct. 1

is president. The associated utility companies interested supply B. C. Cobb as chairman of the new board. The Bonbright interests provide for the new board Landon K. Thorne, Alfred L. Loomis and Horace S. Scarritt. The other members are J. T. Harrington, vice-president of the Penn-Ohio Edison Company, and Jacob Hekma, vice-president of the Commonwealth Power Corporation.

The capital set-up of Allied Power & Light is relatively simple. There are two preferred stock issues in addition to the common shares, but no bonded debt. The first of these is a first preferred issue, $5 series, having no par and issued to the extent of 150,000 shares. The other is preference stock, $3 series, cumulative, having no par, and issued to a total of 100,000 shares. Common stock was issued to the amount of 1,250,000 shares and in addition there were offered option warrants entitling holders to subscribe to 100,000 common shares at $12 per share. These expire Oct. 31, 1928. It was stated at the time of issue that upon completion of financing the securities owned by the corporation at current market prices, together with cash in the treasury, would amount to more than $25,000,000. Market appreciation has brought the total far above this figure.

CAPITAL STRUCTURE OF ALLIED POWER & LIGHT

	Authorized, Shares	To Be Outstanding, Shares
First preferred stock, no par value:		
$5 series, cumulative (this issue)..	150,000	150,000
Not designated as to any series....	150,000	None
Preference stock, no par value:		
$3 series, cumulative	100,000	100,000
Not designated as to any series....	100,000	None
Common stock, no par value*.....2,000,000		1,250,000

*In addition there were issued option warrants entitling the holders thereof to subscribe to 100,000 shares of common stock at the rate of $12 per share, which warrants expire Oct. 31, 1928.

Public Utilities a Sound Investment

"BROADLY speaking," said Archibald Graustein, president International Paper Company, at the fifteenth annual National Business Conference, held at Babson Park, Mass., recently, "utility fields promise stability and appreciation for the investor." This opinion was derived from the following factors:

Light and power companies, constituting the bulk of our public service utilities, may confidently expect a growth in earnings due to, and to a degree commensurate with, the growth of population, a condition which in this country reflects a growth in prosperity; these co-ordinate to increase the use of electric power and to support the utility enterprise and endow it with sound and growing basic factors of strength.

Referring briefly to the development of natural resources, and particularly to private ownership of water rights, the speaker declared that his view of the question was that the welfare of the people was best effected by prompt development of resources as soon as there was a market for the utilization of the products. Water power does not increase in value with time; on the other hand, delay in development, occasioned often by government control, is a handicap to the people if there lies ahead a market for the output.

In the opinion of the speaker, mergers of utilities on a large scale are sound on an economic scale. Faced with the rising cost of materials of the future, the problem of low production costs is extremely important for consideration. The solution lies in the proved practice of locating generating plants near the source of cheap fuel; these sources are tidewater situation for steam plants and interior water-power sites for hydro-electric plants and, between these, for continuous uniform flow of power, the linking up through substations and transmission lines is bound to follow. This trend in mergers is basically an economic step and inevitable if low costs are to benefit the users of electric power.

Bits of Philosophy

"SINCE it is easier to sell an old idea than a new one, new ideas should be placed on exhibition promptly so they will eventually seem old."

"Research is a process of creating reasonable dissatisfaction."

"No progress is made when wants are synonymous with needs."

"Changing mentality affects value placed on things."

"Progress depends on the extent to which you recognize what is wrong with your product and correct it."

"If you want to do anything new don't argue with the trade, but get public acceptance first."

From an address by CHARLES F. KETTERING, *President General Motors Research Corporation.*

Letters from Our Readers

Slide Rule Calculation

To the Editor of the ELECTRICAL WORLD:

In glancing over the article on slide rule calculation of vectors in the ELECTRICAL WORLD for Aug. 25, page 362, I note two typographical errors which leave the process described in the article somewhat confused.

In the last line of the first column of the article in the equation for settings, the letter α should be opposite the letter T, leaving the letter b opposite C. Similarly, in the first line of the next column the parentheses $(90 - \alpha)$ should be opposite T.

In the latter part of the article, where angles are given in degrees and minutes, there is a long dash placed between these figures which looks like a minus sign, although I think no one will be confused by it.

ELBERT G. ALLEN,
Consulting Engineer.
Stone & Webster Engineering Corporation,
Boston, Mass.

Defends 20-Amp. Series Lighting

To the Editor of the ELECTRICAL WORLD:

On page 471 of the ELECTRICAL WORLD for Sept. 8 there appeared a letter to the editor discussing a previous article on the use of the 20-amp. straight series system for street lighting. Through an oversight the size of cable was omitted from the table of comparison in the original article. This should have been given as No. 8 B. & S. gage, which can be verified by checking the cable losses of 27 watts and 250 watts per 1,000 ft. as given in the 6.6-amp. and the 20-amp. columns respectively. It should be mentioned here that the cable referred to in the article, and which is recommended for 20-amp. circuits, is not a steel-armored cable, but is protected by the customary lead sheath and a single or double layer of ply jute saturated with asphaltum compound. The use of a steel tape is conceded by many engineers to be an unnecessary protective measure except under certain conditions of service. In fact, its use on a 20-amp. circuit is prohibited because of the large iron losses that would be incurred.

Taking up the more specific points brought up by Mr. Southeri in his letter to the editor, the first is the exception taken to the price of $210 per 1,000 ft. for cable as shown under the 6.6-amp. heading. This is for single-conductor, 7,500-volt, 30-per cent rubber-insulated, lead-incased, double-jute-covered cable and it seems to compare very favorable with the price of $180 per 1,000 ft. for 3,000-volt steel-taped cable, taking all differences into consideration.

The second point is the question "Why spend $20 for safety coils?" when a compensator of presumably equal rating can be obtained for $9.75. The answer is that the design of ornamental lighting standards is tending toward more slender columns with a straight-line contour to the globe-holding ring, without the unsightly interruption to the continuity caused by a bulging casing or adapter large enough to accommodate a compensator. In other words, the practice over the greater part of the country is to install a weatherproof safety coil in the base of the standard and at the same time obtain the safety of a two-winding transformer, rather than install a casing containing a compensator, which is essentially a transformer and not a safety device.

A third point is that concerning the relative efficiencies of the 6.6-amp. and the 20-amp. lamps. It is true that a difference in efficiency is not perceptible except in sizes of 6,000 lumens or larger, where the difference is in favor of the 20-amp. rating. By using transformers in connection with these lamps any advantage in efficiency is lost or even overbalanced by the losses in the transformers themselves. In this respect the 20-amp. straight series system utilizes the full efficiency of the high-current lamps, since no transformers are used and consequently no additional losses are incurred.

The cost data as given in the letter are, of course, invalid as argument, since they are based on the use of steel-taped cable, which is impracticable for use on 20-amp. circuits, as has been pointed out. In the case of a circuit already supplied by steel-taped cable, a change-over to the 20-amp. system would, of course, be out of the question. However, it has been demonstrated on a number of occasions that a new installation of 4,000-lumen lamps or larger ones can be installed, operated and maintained as a 20-amp. system for less than a 6.6-amp. system using safety coils. This is particularly true when concrete standards are used, in which case provision is not ordinarily made in the standard itself for placing a transformer.

It is true that public liability hazards have been emphasized, but whether or not they have been overemphasized is a debatable question. A single accidental death by electrocution, even through the negligence of the victim himself, will often ruin the prestige which a central-station company has built up through years of effort. This is particularly true in small communities. It appears that the 20-amp. straight series system, with a voltage to ground of one-third that obtained on a 6.6-amp. system of equal kilowatt capacity, would be a desirable medium between the requirements of safety and the alleged tendency to overload with apparatus, such as individual transformers and the more expensive steel-taped cable.

H. E. LIPPMAN,
Illuminating Engineering Bureau.
Westinghouse Electric & Manufacturing Company,
South Bend, Ind.

A New Idea in Office Lighting

To the Editor of the ELECTRICAL WORLD:

Permit me to congratulate A. L. Powell and R. S. Burnap on the very original fixture design described in the ELECTRICAL WORLD of Sept. 15. Any original idea is to be welcomed in the interest of progress, but a good original idea should be received with a brass band and with loud cheers.

In this fixture I can see the germs of many future developments in the art of illumination, particularly the illumination of wall decorations from artistic ceiling fixtures. I can even see a possibility of illuminating power house switchboards from ceiling fixtures, even though of less fancy design.

It was particularly fortunate that the whole problem was referred to the authors in the first instance instead of to the architect plus the fixture manufacturer, or even to the fixture manufacturer minus the architect, or to the electrical contractor minus anything.

The authors were fortunate that the executive was not around when they worked out the design or they might have heard something about "newfangled frills."

M. M. SAMUELS.
J. G. White Engineering Corporation,
New York.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Recent French Developments in Surface Condenser Design.—R. H. ANDREWS.—The design features of surface condensers installed at the Gennevilliers generating station in France were discussed in an earlier article and the author presents the performance tests which indicate that high rates of heat transfer can be obtained with condensers having a large proportion of tubes exposed to the direct impact of the steam, and with the tube bank arranged for tangential flow of condensate. It was the contention of the designers that the general performance of the condenser could be improved by the removal of nearly 2,000 tubes. This contention was substantiated by operating results and two other condensers in the same station will be similarly altered. Steam lanes were widened considerably and the arrangement of the tubes in the tube sheet was radically changed to avoid difficulty with the mud-laden circulating water drawn from the Seine River.—*Power*, Aug. 21, 1928.

High-Pressure Steam Boilers—GEO. A. ORROK.—Among other things it has been brought out in this discussion that a high-pressure boiler must consist largely of banks of tubes, that headers in great variety are available up to at least 1,400 lb. pressure, that drums must be of small diameter and should not contain over 10 per cent of the water content of the boiler, that below 1,000 lb. there is no need of employing alloy steels, but above that pressure such steels are available and should be used if the temperature margins so require, that for superheats higher than 800 deg. alloy steels are indicated, that twenty or more different designs of boilers are successfully operating at pressures of 500 lb. and over, six at 1,000 lb. and one at 2,000 lb. and over, and that enough work has been done to show that their efficiencies are comparable to those obtained with boilers of lower pressure. In closing, the author states his conclusions as to the type of high-pressure boiler best suited to present limitations.—*Transactions of the American Society of Mechanical Engineers*, May-August, 1928.

Some Operating Data of Large Steam-Generating Units. — HENRY KREISINGER and T. E. PURCELL.—This article gives the principal operating data for six large steam-generating units fired with pulverized coal and installed in four plants. All these plants use the storage system of burning pulverized coal and the examples are fairly representative of the large steam-generating units now rapidly coming into use. The operating data are presented graphically and are based upon the hourly output in pounds of steam throughout the period of operation. Whenever the steam-generating unit was shut down the reason for the shutdown is given. There are also presented charts giving the necessary data for the computation of the efficiency for various percentages of rating such as the temperature of flue gases, the percentage of CO_2 in the flue gases and the losses due to incomplete combustion. —*Transactions of the American Society of Mechanical Engineers*, May-August, 1928.

Transmission, Substations and Distribution

Regulations for Overhead Lines.—ALFRED EKSTRÖM and VIDAR EKSTRÖM. —A comparison between the Swedish and the British regulations for overhead line construction has been offered by the authors in connection with a consideration of contemporary practices for such work. Charts illustrative of the standards prevailing in the two countries and a discussion of the practices regarding leakage of current, load and dimensions of poles, tension, sag, distance between conductors, height of poles, diameter of poles and data regarding total costs have been included. A critical discussion of the merits of the standards employed has been appended. —*Electrical Review (England)*, Aug. 31, 1928.

Cable Laying Improvements.—E. S. BYNG.—Several previous articles by the same author in this publication offered consideration of the alternative methods of construction and of the mechanical devices used in cable laying work. The present discussion includes the training of men for the underground work, a special tool kit for cable crews, compensation plans, accident prevention and time schedules for the carrying out of such construction work.—*World Power (England)*, August, 1928.

Insulating Oils for High-Voltage Cables.—T. N. RILEY and T. R. SCOTT. —Attention is drawn to the fact that the majority of the published work on insulating oils has reference to their use for transformers and switchgear. The requirements for cables are briefly outlined. Experimental results are quoted showing the bearing of the physical and electrical characteristics on the performance of the finished cable. The importance, both thermally and electrically, of avoiding gas pockets in the dielectric of a cable in operation is indicated, and the oil characteristics necessary to secure this are stated. A sensitive method of measuring changes in the electrical characteristics is described and a possible application to sludging tests of transformer oil is suggested.—*Journal of the Institution of Electrical Engineers (England)*, August, 1928.

Generation, Control, Switching and Protection

The Hofen Automatic Hydro-Electric Power Station of the St. Gall Municipal Electricity Supply.—The plant covered by this discussion, while of a small-head low-power characteristic, is said to be typical of a hydro-electric plant in which automatic operation may be applied to the fullest advantage according to European practice. Complete details regarding station operation in connection with starting up, shutting down, disturbances and economic considerations have been included. The author states that from a financial point of view alone automatic hydro-electric power stations are usually profitable. Combined with this is the fact that when disturbances occur good relays undoubtedly work with a far higher degree of accuracy than can be expected from an attendant and thus they afford better protection for the plant under all circumstances.—*Brown Boveri Review (Switzerland)*, August, 1928.

Units, Measurements and Instruments

The Calibration of Power Meters.—A. BARHAM.—A method of calibrating meters on the job with the aid of portable apparatus, which it is claimed will eliminate all uncertainty as to satisfactory adjustments. The author has designed and constructed portable polyphase equipment which covers the range of any integrating meter, kilowatt-hour or kilovolt-ampere-hour or sine-recording and indicating instruments used in the measurement of electric power and protective equipment. The test apparatus is of 15 amp. maximum capacity, as 10 amp. is standard to all series transformers used in the organization with which the author is connected. The device may be employed in any location where a 400-volt, three-phase supply is available, at either 50 or 25 cycles. The equipment is complete as regards all essential details for the work for which it was designed.—*Electrical Review (England)*, Aug. 31, 1928.

Apparatus and Methods for Measurement of the Hertzian Hardness.—R. ESNAULT-PELTERIE.—Following a brief survey of the various methods in common use for determination of hardness and an enumeration of their relative advantages for indicating the desired information, a scheme devised by the author for this measurement is presented. The two spheres in the experiment were subjected to constant and successively increased pressure. One sphere was coated with a very thin coating, which renders the zone of contact visible

after each compression. The diameter of the circle of contact is then measured and a curve is obtained representing the variation of this diameter as a function of the force exerted on the two balls. In this way it is possible to ascertain the maximum pressure per unit area; that is, the maximum stress that the ball can stand without risk of permanent change of form. The theory of Hertz enables the pressure per unit area or stress to which the ball is subjected in a bearing to be determined as a function of the four principal curvatures at the point of contact, the two relating to the ball being equal to each other and one of the two relating to the race being zero, and of the total load carried by the whole bearings. The author states that the method of measurement proposed by him appears, from the practical point of view, to be perfectly satisfactory and a great improvement upon any purely empirical methods.—*Engineer (England)*, Aug. 17, 1928.

Rayleigh Disk Method for Measuring Sound Intensities.—L. J. SIVIAN.—The theory of the method involved and an experimental verification of a modification of the Rayleigh disk method which employs the disk as a torsional pendulum driven by sound waves and modulated with the natural frequency of the disk is offered. The usual procedure is to measure the steady deflections of the disk under the influence of a steady sound field. In this instance the procedure involved is that applicable when the sound amplitude can be made a suitable function of time. The scheme depends upon the fact that the torque which the sound wave exerts on the disk is a non-linear function of the sound amplitude. The amplitude of the sound wave to be measured is modulated with a frequency equal to that of the free vibration of the disk. The measurement consists in reading the amplitude of oscillation corresponding to the modulating frequency rather than a steady deflection of the disk. The disturbances caused by spurious air turns are largely reduced. In addition, for many practical cases at least, there is a gain in absolute sensitivity.—*Reprint B-302 Bell Telephone Laboratories, Inc.*

A Thermionic Voltmeter for Measuring the Peak Value and the Mean Value of an Alternating Voltage of Any Wave Form.—E. B. MOULLIN.—The instrument described in this article may be used to measure the peak and mean values of any alternating wave form. It is provided with two scales and one dial, corresponding to peak and mean values, and a change-over switch converts the voltmeter from one reading to the other. The peak value is measured by the mean grid current of a cumulative grid rectifier. It is shown by experiment that the mean grid potential is sensibly equal to the peak value of a sinusoidal voltage, and an approximate analysis is developed by which the mean grid current can be predicted accurately. The mean value measurement is made by omitting the grid condenser, and the accuracy of the method is discussed analytically and substantiated experimentally. An application of the voltmeter is illustrated by curves which indicate the distortion produced by a four-stage thermionic amplifier.—*Journal of the Institution of Electrical Engineers (England)*, August, 1928.

Motors and Control

Eddy Current Loss in the Armature Conductors of Electrical Machines Due to the Main Flux.—The results of a comprehensive investigation on the part of several organizations in regard to the subject of eddy current losses. The problem of obtaining data upon which to base the predetermination of the main flux loss may, it is stated, be attacked by three general methods, namely, analytical, empirical and experimental. Each of these plans has been considered in the article and a detailed study of the problem undertaken, including the factors of distribution of slot fluxes, factors giving rise to slot flux and their effect on the loss, experimental determination of the eddy losses, the results obtained in experimental machines, a comparison of experimental and theoretical results, the effect of load on eddy loss, the practical influence of the eddy loss and similar points of importance.—*Journal of the Municipal College of Technology, Manchester (England)*, Vol. XIII.

Heat Applications and Material Handling

Building Surface Condensers by Arc Welding.—BIRDSALL H. NICHOLS.—A definite plan for the fabrication of surface condensers, utilizing the process of arc welding joints, has been offered by the author. The advantages of this type of construction, the potential difficulties involved in adapting it to the specific purpose, the shortcomings of other methods of construction, and the probable economies involved have all been covered.—*Power*, Sept. 11, 1928.

Electrophysics, Electrochemistry and Batteries

An Experimental Investigation of Forced Vibrations.—L. W. BLAU.—The subject of forced vibrations has been investigated rather fully, both mathematically and experimentally, but neither the relations derived nor the results exhibit clearly the principal facts of this type of motion. The author has accordingly derived an equation and offered an exposition of an experimental arrangement which permits of the investigation of force vibration. Photographic records indicate and verify the theoretical results. The universality of wave phenomena and the various branches of science to which the results of this investigation may be applied have been pointed out and certain variations connected with damping and beats are indicated as influencing the mathematical expression which may be utilized for accurate representation of physical phenomena.—*Journal of the Franklin Institute*, September, 1928.

Telegraphy, Telephony, Radio and Signals

On the Predetermination of Oscillating Amplitudes and Circuit Constants Under the Condition of Maximum Output of Triode Oscillators.—K. KUROKAWA and K. HAYAKAWA.—The static characteristic surface of the plate current of triode tubes as a function of the plate and grid voltages is assumed to be represented by the intersection of four planes. The current and voltage amplitudes of the oscillating circuit may be calculated from the condition of equality of the mean power supplied to the oscillating circuit by the source and tube and that consumed in the oscillating circuit neglecting the grid circuit loss. The calculated values are shown to agree closely with those determined in experiments. The authors point out that one of the extremities of the plate current curve which gives the maximum output appears to be located in the vicinity of a particular point on the characteristic surface under working conditions.—*Journal of the Institute of Electrical Engineers of Japan*, August, 1928.

Miscellaneous

The Flexibility of Plain Pipes.—J. R. FINNIECOME.—Among the factors recognized by the author as essential to good design for fuel economy and high thermal plant efficiency in installations involving pipe lines are the pressure drop, radiation loss, stresses due to internal pressure and thrust, flexibility due to temperature and thrust and economic cost. A series of articles, confined largely to a discussion of the flexibility of pipes as related to temperature changes and thrust, has been undertaken in recognition of the importance of piping in modern steam stations. As a result of an analysis of the mechanical factors involved a detailed investigation has been undertaken. Results are expressed graphically for ready use and checked against data obtained in laboratory work.—*Engineer (England)*, Aug. 17, 1928.

Analysis of Bauxite and of Refractories of High Alumina Content.—G. E. F. LUNDELL and J. I. HOFFMAN.—A study has been made of the analytical details involved in the analysis of bauxite and burnt refractories of high alumina content. The work has shown that an accurate analysis of these materials is a far more difficult problem than it is ordinarily thought to be. In spite of the fact that the determination of alumina is usually regarded as very simple, extreme values differing by some 2 per cent are encountered. The improper drying of bauxite and the difficulty of putting burnt refractories into complete solution were found to be sources of error. Other sources of error, such as improper ignition of precipitates of aluminum hydroxide, giving misleading impressions for impurities derived from reagents, etc., are pointed out.—*Bureau of Standards Journal of Research*, July, 1928.

Book Reviews

Electric Winders

A Manual on the Design, Construction, Application and Operation of Winding Engines and Mine Hoists. By H. H. Broughton. New York: D. Van Nostrand & Company, 401 pages, illustrated. Price, $15.

This is a masterly treatise on hoists devoted to coal and metal mining. The author has analyzed over 700 winding engines and has used drawings and illustrations to bring out design and operating characteristics. But beyond the description of particular apparatus, largely peculiar to Great Britain, he has given the requirements of engines and hoists. Complete analyses are made of duty cycles, of operating requirements and of the fundamental technical aspects of winding and hoisting. Drums, machine rating, load equalizers, power supply, control equipment, effect of compound shafts and multiple levels, brakes, ropes and other items in hoisting engineering are discussed at length. The book gives the fundamental data and theory for the solution of winding and hoisting and does not depend on a description of equipment more or less transitory in the art. It is a very welcome contribution to a branch of engineering that is making rapid strides in this country.

Electric Heating

By E. A. Wilcox. New York: McGraw-Hill Book Company. 469 pages, illustrated.

At this time there is a great deal of interest in electric heating. Utilities are trying to sell this load, industrial plants are trying to use electric treating to reduce costs and improve quality and heating equipment manufacturers are active in developing new equipment and new applications. It has been said that the electric heating load is equal to the present motor load.

Electric heating is a subject about which little has been published in book form and about which many misconceptions have developed. It has grown in application by empirical methods and is just reaching a stage where intelligent and logical engineering attacks are made. In this volume Mr. Wilcox gives a very complete coverage of the art and the practice. He discusses the fundamentals of heat and electricity, heating elements and units, electric cooking, water heating, air heaters, oven heaters, furnaces, metal melting, arc and resistance welding, japanning and many other applications. In so far as possible each type of application is treated in a fundamental manner and is completed by illustrations, data and descriptive material. There is a dearth of quantitative cost and performance data on electric heating, but the author uses all that is available to make the subject tangible.

Power sales, consulting and other engineers will welcome this book and colleges might do well to use it as a text for engineering students. The subject is important and this book is very timely.

Höhere Mathematik

By R. Rothe. Leipzig and Berlin: B. G. Teubner. 186 pages, 155 diagrams.

The series is to consist of three volumes; the first has been published and now appears in a second edition. The chapter headings indicate the scope: Numbers, variables and functions; essentials of differentiation and basic formulas for integration; functions of two or more variables; differential geometry of plane curves; complex numbers, variables and functions. In addition to the matter common to most textbooks of its general class, it introduces such topics as hyperbolic functions (rather briefly), envelopes, inverse functions, caustics. Discussion of problems from the field of physics and mechanics serves to connect mathematical theory and applications. The 118 problems set for the student to solve—an essential feature in a textbook—also deserve mention. The condensation necessary to cover the ground outlined in a small volume will probably call for considerable explaining on the part of the teacher if the book is used with students of the usual mental equipment, unless rote is accepted for grasp. To the American educator it will be of interest as showing contemporary German instruction for prospective engineers, physicists and mathematicians.

Ice Engineering

By Howard T. Barnes. Montreal, Canada: Renouf Publishing Company. 364 pages, illustrated.

This is not a book dealing with the manufacture of artificial ice. It deals with natural ice, its formation, its behavior and its control. Many hydroelectric properties will appreciate the material presented by Professor Barnes, for it will help to solve the ice problems so frequently encountered. Some day the ice barrier to full development of northern water powers may disappear, and this book shows to what extent this problem has been mastered today.

Chapters deal with the equilibrium of ice-water systems, physical constants of ice, rate of growth and melting of ice, frazil ice, ice remedial work with steam, thermit, hot water and chemicals, ice pressure and expansion, ice navigation, icebergs and the conservation of heat to prevent ice formation at power houses and in canals.

The book is sound in its underlying physics and contains a great deal of practical descriptive matter on methods used to conquer ice in canals, rivers and at hydro stations.

Storage Batteries, Theory, Manufacture, Care and Application

By Morton Arendt. New York: D. Van Nostrand Company, Inc. 283 pages, illustrated.

Storage batteries are old devices in the electrical industry, but the art changes with the years, as do the applications. In this book Professor Arendt has dealt briefly with the theory of the battery and has stressed the practical features of manufacture, operation and maintenance. The lead-acid and nickel-iron batteries are discussed from a performance point of view and the influence of physical constituents is outlined. The manufacture and characteristics of plates, battery testing and battery applications round out a very good addition to storage battery literature.

Book Notes

PATENTS—How to Get and Sell Them. By Ray Belmont Whitman. Girard, Kan.: Haldeman-Julius Company. 64 pages.

This booklet answers many questions that arise in creating, developing, protecting and capitalizing inventions.

VESTIGES OF PRE-METRIC WEIGHTS AND MEASURES PERSISTING IN METRIC SYSTEM IN EUROPE. By A. E. Kennelly.

As stated by Dr. Kennelly, the research subject of residual weights and measures is fascinating and many-sided. He has delved into languages, law, folklore, history, psychology, physics and other fields. He regards the metric system as an accomplished fact in Europe and says residual units are trivial exceptions of merely scientific interest. No doubt he wishes the same conditions prevailed in this country. It is remarkable to note that since 1800 a group of more than thirty countries in Europe have discarded their old systems and have adopted and used the metric system. The simplicity of the new system and its advantages in international commerce won the battle for the metric units. In many cases the changes were very rapid but, as a whole, time was required, especially in land tenure and registry. But today Dr. Kennelly reports a complete acceptance of the system in continental Europe. Only John Bull and Uncle Sam among progressive countries retain a pre-metric system.

Books Received

Wirkungsweise elektrischer Maschinen. By Vidmar. Berlin: Julius Springer. 243 pages, illustrated.

Standards and Standardization. By Norman F. Harriman. New York: McGraw-Hill Book Company. 265 pages, illustrated. Price $3.

A Course in Electrical Engineering. By Chester L. Dawes. New York: McGraw-Hill Book Company. 618 pages, illustrated. Price, $4.

Electric Lines and Nets. By A. E. Kennelly. New York: McGraw-Hill Book Company. 426 pages, illustrated. Price $5.

Heaviside's Electrical Circuit Theory. By Louis Cohen. New York: McGraw-Hill Book Company. 169 pages. Price, $2.50.

Engineering Education. By Ray Palmer Baker. New York: John Wiley & Sons, Inc. 233 pages. Price, $2.

News of the Industry

Rate Cut in Twin Cities

Saving of $800,000 a Year to Minneapolis and St. Paul Customers of Northern States Power Company Is Indicated—Optional Rates Offered

VOLUNTARY reduction in electric light and power rates in Minneapolis and St. Paul totaling $800,000 a year for 135,000 customers was announced last week by R. F. Pack, vice-president and general manager of the Northern States Power Company. The saving to consumers in Minneapolis will be about $480,000 a year on the basis of present consumption, and that to St. Paul customers $320,000. The reduction will take effect on Nov. 1.

With reductions made by the company in other towns in Minnesota and towns in North and South Dakota in the last ten months, the total yearly savings to users of electricity on the Northern States system are put at more than $1,000,000 by Mr. Pack, who predicted that with the expected stimulus to consumption further reductions may come within a relatively short time.

The reduction affects residence, commercial lighting and retail power rates. Optional residence rates are offered. One follows the form of the old rate structure with the top step cut from 10 cents to 9 cents for the first 3 kw.-hr. per room a month, then 7½ cents for the next 3 kw.-hr. per room and 3 cents per kilowatt-hour for the excess, with a 5 per cent discount for prompt payment. The other rate now offered binds the user to agree to pay for at least a year a fixed monthly charge of 25 cents a room a month plus an energy charge of 3 cents per kilowatt-hour, the 5 per cent discount applying only to the latter part of the charge.

Commercial lighting rates, affecting 15,000 customers in Minneapolis and a proportionate number in St. Paul, will be reduced from 9½ cents for the first 200 kw.-hr. and 5 cents for the excess to 9 cents for 100 kw.-hr., 7½ cents for the next 100 kw.-hr. and 5 cents for the excess. Retail power, now paying 7½ cents each for 52 hours' use of maximum demand and 3 cents per kilowatt-hour for the excess, with quantity discounts, will be billed at 6¼ cents and 2.7 cents minus discounts.

Rate Reduction in Georgia Is Sought by Commission

Reduction of electric rates in Atlanta and all the 150 communities served by the Georgia Power Company in northern and eastern Georgia is sought by the Georgia Public Service Commission. Rates paid for electric service in the territory outside of Atlanta, the commission says, range from 2 to 3 cents per kilowatt-hour higher than those effective in the city, where residential users pay 9 cents per kilowatt-hour, with a discount of 10 per cent for prompt payment. The commission has asked the Georgia Power Company to show cause at a hearing scheduled for Nov. 7 why the rates in other cities should not be made uniform with rates prevailing in Atlanta.

Lowell (Mass.) Residential Rate Case Settled

By agreement with Mayor Thomas J. Corbett of Lowell, Mass., and with the approval of the Massachusetts Department of Public Utilities, contention over the residential lighting rates of the Lowell Electric Light Corporation has been adjusted. Effective Nov. 1, the present flat rate of 9 cents per kilowatt-hour will be abolished. The new rate will embrace a monthly service charge of 50 cents and a charge of 7 cents per kilowatt-hour for the first 30 kw.-hr. used in any month and 6 cents for the excess energy used. The present area rate continues optional. The city sought a 5-cent rate, but this settlement was reached after extended conferences in preference to going on with the hearings.

Sparks Fly in Seattle Over the Price of Railway Energy

A. W. Leonard, president of the Puget Sound Power & Light Company, has submitted an offer to the Seattle City Council to furnish all the electrical energy required to operate the Seattle Municipal Street Railway system at the rate of 1 cent a kilowatt-hour. Mr. Leonard's offer followed an announcement that members of the City Council had abandoned plans to reduce the cost of energy sold to the railway when C. E. Lundgren, chief accountant for the Light Department, informed them that it now costs 1¼ cents a kilowatt-hour to produce the energy which is sold to the railway system for 1 cent. The actual cost of production last year, Mr. Lundgren declared, was 1.2 cents, this being a slight reduction from 1926.

"Since, according to the City Light Department, it is actually losing ¼ cent on each kilowatt-hour furnished," Mr. Leonard said, "our offer would save the Light Department approximately $85,000 annually and would release the power which the city is now selling at a loss to meet the shortage which the city claims exists in its present generating capacity."

"Mr. Leonard can't sell power to the street railway at 1 cent and make a profit if he assumes the burden City Light now carries for new buildings, equipment and machinery, to take the place of the old stuff sold us when the city took over the street railway from his company, together with the cost of the operators in charge of generators transforming alternating to direct current for the use of the cars," W. J. McKeen, assistant to the superintendent of city light, answered in the absence of Superintendent J. D. Ross. "Talk of furnishing electricity at 1 cent is buncombe," he went on. "Mr. Leonard knows he can't do it and we know he can't. We can sell energy cheaper than Leonard and make a profit."

Technical Committees Getting Busy

Particular Interest Is Manifest at Philadelphia Organization Meeting in the Problems Falling to the New Committee on System Engineering

TECHNICAL committees of the Engineering National Section of the National Electric Light Association met in Philadelphia this week to outline their programs and organize for work. Their task has become relatively simple of late years because new chairmen have had the background and experience gained from working with the former chairmen and thus are able to carry forward the work of previous administrations. The attendance was excellent and every one manifested an enthusiasm to tackle the problems that remain unsolved.

Greater over-all economy of operation and increased reliability continue to be the motivating forces in every committee, whether it deal with system engineering, electrical apparatus, prime movers, hydraulic power, overhead and underground systems, meters or accident prevention. Most cordial relations with those who administer communication and signal systems were evident on the part of the inductive co-ordination committee, although problems still remain. System engineering, the concern of a committee formed this year, evoked particular interest, judged by the attendance and the sustained discussion. Opinions on what constitute the major factors in system engineering were recorded as follows: Load surveying and forecasting, principles of interconnection between utility systems and with industrial lines, interconnection schemes, factors affecting stability, interconnection at different frequencies and voltages, supply to railroads and electrification projects, effect of automatic and supervisory control on system design, regulation of distribution voltage, division of load between parallel circuits

and between energy sources, control of load frequency, voltage and wattless energy, and high load density.

Distribution-system operating problems and their solution constituted the chief subject discussed by the electrical apparatus committee, and distribution rehabilitation received considerable attention from the overhead systems committee. Wednesday was devoted to inspection trips, including one to the Plymouth Meeting substation of the Philadelphia Electric Company and one to Conowingo.

New Officers for I.E.S.

Officers of the Illuminating Engineering Society for the society year just begun have been elected as follows: President, Merritt C. Huse, Philadelphia Electric Company; vice-presidents, H. H. Magdsick, Lamp Works of General Electric Company, Cleveland, and W. F. Little, Electrical Testing Laboratories, New York; treasurer, Clarence L. Law, New York Edison Company; general secretary, A. B. O'Day, Lamp Works of General Electric Company, Harrison, N. J.

Setting up the Brown-Boveri Unit at Hell Gate

Work of installing one of the largest generating sets yet manufactured is now in full swing at the Hell Gate station of the United Electric Light & Power Company, New York. This unit was made in Switzerland by the Brown-Boveri Company and was shipped from Antwerp, transferred to a lighter and taken to the power plant for erection. The following description of the 160,000-kw. unit has been authorized:

This unit comprises a 75,000-kw., 1,800-r.p.m. high-pressure turbine and an 85,000-kw., 1,200-r.p.m. low-pressure element. It is designed for steam pressure of 265 lb. gage and 700 deg. F. total steam temperature. Two bleeding points are provided—one in the outlet from the high-pressure cylinders and the other from the fourth stage of the low-pressure turbine. The condensate temperature is raised in the closed heaters to 210 deg. F. The primary valve of this turbine is wide open at 90,000-kw. and the secondary reaches the limit of its value at 130,000 kw.

The rotor of the high-pressure turbine is directly connected to an 88,250-kva., 60-cycle, three-phase, 13,800-volt generator and the low-pressure rotor is coupled to a 100,000-kva. generator which is operated in parallel with the high-pressure element. The low-pressure unit exhausts into a Westinghouse condenser of 137,500-sq.ft. surface.

There are three Springfield sectional header cross-drum water-tube boilers each rated at 2,000-hp. These boilers can evaporate 400,000 lb. per hour each. The superheater, which has a surface of 4,800 sq.ft., will raise a steam temperature of 730 deg. F. These boilers will use the unit-type combustion system as distinguished from the "bin" type.

Advertising Activities of N.E.L.A. Explained

Mrs. J. D. Sherman's Connection with Organization's Publicity Comes up Before Federal Trade Commission—Nature of the Barton Leaflets

EARLY closing of its forms necessitated by a public holiday makes it impossible for the ELECTRICAL WORLD to carry this week a report of the hearings in the utility investigation of the Federal Trade Commission that were to open on Wednesday.

The session of Oct. 4 was short and dealt mainly with the introduction of exhibits in connection with previous testimony. George F. Oxley, publicity director of the National Electric Light Association, was recalled to clear up a few points concerning its advertising activities. As previously brought out, Mrs. J. D. Sherman, ex-president of the General Federation of Women's Clubs, received payment for articles published through the advertising agency of Lord, Thomas & Logan. Mr. Oxley said she has been paid $600 per month since October, 1926, and that the arrangement still continues. She has prepared a number of articles, of which some are in the hands of the N.E.L.A., some have been rewritten by Mr. Oxley and released and some published under Mrs. Sherman's name.

Most of the published articles went to farm journals and included such titles as "The Prairie Farmer—Don't Let Mother Carry in the Water" and other subjects which lent themselves to recommendations for home electrification. The stories usually started off with her picture and a caption such as "Mary Sherman Points Out Advantages of Better Home Equipment . . . President of the General Federation of Women's Clubs and a Leader in the National Home Equipment Survey."

Some of the Barton advertising leaflets were submitted. Most of these dealt with accomplishments of the industry, employing humorous cuts and phrases to arrest attention. In each was a graph on a pink or mauve background with a jagged trace at the top representing cost of living or some other economic factor and at the bottom a smooth horizontal line labeled "cost of electricity." In one the upper graph purported to show the percentage of increase in cost of government over a period of years. The point is made that the basis of comparisons could not possibly be determined from the captions as given. The leaflets were employed to back up the following admonition: "We are proud of our government and glad to pay for it. But don't let any orator tell you that the government can run a business cheaper than business men can run it under public regulation."

Rural Service Interests Southern Men

Power Conference at Atlanta Hears Topic Discussed from Manufacturers' and Agricultural Standpoints—Gettle on Qualifications of State Commissioners

THE Southern Appalachian Power Conference opened its fourth meeting on Oct. 8 at the Atlanta-Biltmore Hotel, Atlanta, with a three-day session ahead. An address of welcome was made by George M. Napier, Attorney-General of the state. Dr. Andrew M. Soule, president of the conference and also of the Georgia Agricultural College, made the opening address.

C. W. Appleton, vice-president of the General Electric Company, then addressed the meeting on the subject of the manufacturers' interest in rural service, touching upon the problems of farm electrification. He sketched briefly what equipment manufacturers had done to overcome the difficulties in the way of a broader use of electricity by the rural population. J. T. McAlister, secretary of the South Carolina Committee on the Relation of Electricity to Agriculture, spoke on "Power a Factor in Solving Farm Problems." He said: "In the manufacturing industry production is based upon the productive capacity per worker, while in agriculture it is on the yield per acre, and this fact more than any other seems to explain the condition in which agriculture finds itself in relation to other industries." Mr. McAlister asserted that labor is the largest item of cost in farm production and that a reduction of this labor cost was necessary in solving the farm problem. Electricity was the answer. He stressed the importance of educating the farmer to the efficient uses of electricity and the necessity for continued research in this connection.

The Tuesday morning session opened with a paper by Lewis E. Gettle, chairman Railroad Commission of Wisconsin, on the operation and effectiveness of public utility commissions in regulating rates. Mr. Gettle maintained that while a public service commission was of necessity a political body, its work was fact-finding and the personnel should be men with ability and training to understand technical problems. Their value to the organization should not be measured by a political standard and the commission should be free from political interference. He approved of the tendency to merge power companies, saying that mergers had resulted in operating economies and improved service and had been in a large measure responsible for rural electrification.

Another speaker at one of the earlier sessions was C. O. Yoakum of Birmingham, executive vice-president General Securities Corporation. Monday night's session was given over to an illustrated lecture on forest conservation by H. Frothingham, United States Forest Service.

Hoover and Muscle Shoals

Republican Presidential Candidate Holds Federal Ownership in This Instance Desirable—Reiterates His Opposition to Government in Business in Tennessee Speech

ALTHOUGH Herbert Hoover, the Republican candidate for the Presidency, has not as yet redeemed the promise made in his speech of acceptance to discuss at a later time, among other things, "the relation of our government to public utilities and railways," he included in the course of an address, largely of a non-partisan character, made at Elizabethton, Tenn., on Oct. 6, the following reiteration of his opposition to government entering business:

I do not favor any general extension of the federal government into the operation of business in competition with its citizens. It is not the system of Lincoln or Roosevelt. It is not the American system. It not only undermines initiative but it undermines state and local self-government. It is the destruction of states' rights Democracy, however, must be master in its own house. It can assure the conservation of our governmentally controlled natural resources in the interest of the people. It has demonstrated that by the power of regulation it can prevent abuse; it can and must control natural monopolies in full public interest. It can do so without abdicating the very principles upon which our nation has been founded and through which we have reached a standard of living and comfort unparalleled in the world. Violations of public interest by individuals or corporations should be followed by the condemnation and punishment they deserve, but this should not induce us to abandon progressive principles and substitute in their place deadly and destructive doctrines. There are local instances where the government must enter the business field as a by-product of some great major purpose, such as improvement in navigation, flood control, scientific research or national defense, but they do not vitiate the general policy to which we should adhere.

Subsequently at Washington, besieged to make clear whether his speech had any bearing upon the government's relation to Muscle Shoals, this inquiry being based on the Knoxville *News-Sentinel's* report of a conversation with its editor in which Mr. Hoover was quoted as in favor of the continued government ownership and operation of the famous plants on the Tennessee River, Mr. Hoover gave out this statement:

Some discussion has arisen in connection with Muscle Shoals. I stated at Elizabethton that "I do not favor any general extension of the federal government into the operation of business in competition with its citizens." I further stated that there are local instances where the government must enter the business field as a by-product of some great major purpose, such as improvement in navigation, flood control, scientific research or national defense, but they do not vitiate the general policy to which we should adhere.

The news item from Knoxville specifically states: "Asked concerning the reference in his speech to the desirability of government ownership in certain instances, Mr. Hoover said: 'You may say that means Muscle Shoals.'"

In this statement I was correctly quoted. There is no question of government ownership about Muscle Shoals, as the government already owns both the power and nitrate plants. The major purposes which were advanced for its construction were navigation, scientific research and national defense. The Republican administration has recommended that it be dedicated to agriculture for research purposes and development of fertilizers, in addition to its national defense reserve. After these purposes are satisfied there is a by-product of surplus power. That by-product should be disposed of on such terms and conditions as will safeguard and protect all public interest. I entirely agree with these proposals.

Power Propaganda Figures in Washington Primaries

Decisive defeat in the Republican primaries of Washington State of Mrs. J. C. Preston, for sixteen years Superintendent of Public Instruction in that commonwealth, is attributed to charges that she permitted the use in the schools of a number of booklets dealing with various industrial plants including one concerning the Puget Sound Power & Light Company which is said to have contained arguments for private as against public ownership of utilities. This booklet aroused the animosity of supporters of municipal power plants, especially in Seattle and Tacoma. Mrs. Preston, who denies the charges made against her, is accused of having being paid a small sum for editing some of the pamphlets. The Federal Trade Commission is to investigate the matter.

Ohio's Utility Law Still a Political Issue

The Pence public utility law, a political bone of contention in Ohio ever since its passage six years ago, has a new opponent in Myers Y. Cooper of Cincinnati, the Republican nominee for Governor. Mr. Cooper declares himself in favor of repeal of the law because he says it smacks of special privilege. He has joined in the stand of Attorney-General Edward C. Turner, one of his unsuccessful opponents in the primaries for the Republican gubernatorial nomination, who built his campaign largely around opposition to the Pence law and public utility interests.

Under the Pence law public utilities are allowed to collect increased rates for service under bond filed with the state, provided that the public utility commission has not acted on the new rate schedule. The customer is entitled to the return of all excess payments upon showing his receipts if the new rates are not allowed. Mr. Cooper says he believes that if the law is repealed it will be possible to reach some absolutely fair solution to the consumer and the utility. He says he favors a fair return on the investment for service rendered by utilities, but he does not want any one who does business with the State of Ohio to have a special privilege.

Utility Regulation, Rates and Kansas Politics

Both Party Platforms Contain Recommendations Looking Toward a Reduction of Prices to Consumers—Community Control Favored by Democrats

PUBLIC utility matters in Kansas are receiving a substantial share of interest on the part of both Republican and Democratic nominees for the governorship and in the platforms of both parties. Clyde M. Reed of Parsons, former chairman of the Kansas Public Service Commission, is the Republican candidate, and Congressman Chauncey B. Little of Olathe the Democratic.

The Republican platform devotes more than 200 words to the public utilities "issue," which outstrips in length the consideration given any other subject. In brief, it pledges the party to "strengthen the laws regulating public utility companies; to provide that appeals [from commission decisions] shall be tried in the county where the cause originates, and to investigate thoroughly all public utility rates to the end that the customer may have the benefit of lowered cost of production." It also declares that although "there has been a constant decline in costs [since the World War] and a great advance in the art of producing electric current . . . with consequent economies, these economies have not been generally reflected in lower rates."

The Democratic platform declares in favor of "the adoption of legislation looking toward the restoration of control over public utilities to the communities in which they operate, but if the present system of commission control is to be maintained, we favor legislation which will compel utilities to adopt a single valuation for both rate making and taxation." Pledging himself in favor of reducing utility rates, Mr. Little asserts that "Kansas people are paying too much for gas, water, telephones, railroad rates and electric lights . . . rates higher than during the war." He charges that "public service corporations are averaging 8 and 10 per cent on stock investments while the return on farm investments is 1½ per cent."

A.S.M.E. Hears About Power Supply for New England

"Power Supply for New England Industry," by Colonel F. M. Gunby, associate with Chas. T. Main, Inc., Boston, was the subject of the outstanding paper at the power session of the convention of the American Society of Mechanical Engineers held at Boston last week. Colonel Gunby arrived at the conclusion, after a study of the rates of various companies, that the cost of purchased power in New England averages 5 to 10 per cent higher for single-shift work than in the Central West and Middle Atlantic States and still higher for double-shift work on account of the

distance of New England from the fuel supply. Southern rates, he concluded, are still lower, but the author cautioned his hearers to bear in mind, before too literal an acceptance of these figures in specific cases, the differences in company methods for determining demand and in rate form, power-factor clauses and so forth. These differences were further emphasized and some dissent from Colonel Gunby's conclusions was expressed in the discussion, which was participated in by Prof. Philip Cabot, I. E. Moultrop, A. W. Milliken and others, with written contributions by Samuel Ferguson, L. L. Elden, W. H. Larkin and others.

Professor Cabot suggested that all the operating power companies in New England might be advantageously combined in a holding company to facilitate the supply of energy under the most favorable prices to stimulate industrial development. A synopsis of both Colonel Gunby's paper and part of the discussion which it aroused will appear in a future issue of the ELECTRICAL WORLD.

Atlantic Meeting of A.I.E.E. Will Appeal to South

A technical program particularly attractive to Southern members of the American Institute of Electrical Engineers has been prepared for the regional meeting to be held at the Atlanta-Biltmore Hotel, Atlanta, on the last three days of this month. There will be, in addition, a general meeting with addresses by well-known speakers, and on Tuesday afternoon inspection trips to points of engineering interest, followed in the evening by a dinner-dance. The advance technical program, printed in the ELECTRICAL WORLD for Sept. 8 (page 478), remains unchanged except that a paper on high-voltage flashovers, by J. T. Lusignan, Jr., General Electric Company, has been substituted at Tuesday morning's session for one on magnetic skin effect in dynamo steel, by Prof. D. P. Savant, Georgia School of Technology.

Preparations for N.E.M.A. Meeting Complete

Assembly of 27 sections of the Apparatus, Appliance, Supply and Radio Divisions of the National Electrical Manufacturers' Association will bring together more than three hundred members at the fall meeting of the association to be held at Briarcliff Manor, N. Y., the week beginning Oct. 29. The board of governors will meet on Wednesday morning. Numerous section and committee meetings make up the rest of the business program.

Addresses scheduled for the general session on Tuesday evening, Oct. 30, include: "'Nema's' Position in the Industry," by President Huntington B. Crouse; "Adequate Tariff for Electrical Products," by Thomas Allen, Macallen Company, Boston; "Radio Broadcasting and Television," by Louis B. F. Raycroft, vice-president Radio Division, N.E.M.A.; "Terms of Payment," by H. T. Bussmann, president Bussmann Manufacturing Company, St. Louis, and an address by Francis E. Neagle, counsel for the association.

Purchases and Mergers

New York State Subsidiaries of Associated Gas & Electric Unite—Puget Sound Power & Light Readjusts Relations with Stone & Webster

SANCTION has been given by the New York State Public Service Commission to the transfer of the franchise and properties of the Harlem Valley Electric Corporation to the Eastern New York Electric & Gas Company (formerly Plattsburg Gas & Electric Company), according to an announcement made by the Associated Gas & Electric Company, of which the other two form a part. Twenty-two properties are involved. The properties in the Harlem Valley group include the Harlem Valley Electric Corporation, Amenia Electric Light & Power, Carmel Electric Light & Power, Chatham Electric Light, Heat & Power, Katonah Lighting, Lebanon Valley Lighting, Morgan & Wyman Electric Light & Power, Wynantskill Hydro-Electric, George Juengst & Sons (Croton Falls electric plant) and the New York portion of the Ridgefield Electric Company of Connecticut. The Eastern New York Electric & Gas group embraces the former Plattsburg Gas & Electric Company, Chasm Power Company, Champlain Electric, Bouquet Electric Power, Norman I. White electric plant at Ellenburg, Fenton W. Barber electric plant at Lewis, J. Lawrence Webster electric plant at Elizabethtown and Peck Brothers electric plant at Shushan. In addition to them, there are the former Granville Electric & Gas Company, Salem Light, Heat & Power, Halfmoon Light, Heat & Power and the Dwaas Electric Company.

Applications are now pending for the purchase by Eastern New York Gas & Electric Company of the Northern Adirondack Power Company and the Berlin Electric Light, Heat & Power Company, which then would be merged. The Northern Adirondack Power Company will fill a gap between the Associated system's Plattsburg group and the newly acquired properties around Essex to the south. The Berlin company, lying between the old Harlem Valley and the Eastern New York groups, will bring these groups closer together. Construction of a transmission line between Amenia and Copake, now under way or proposed, will result in a line through the Harlem Valley from Katonah to Wynantskill, more than 100 miles. This will leave only a gap of about 10 miles between Wynantskill in the Harlem Valley group and the Eastern New York group.

Puget Sound Power & Light Company directors have completed arrangements whereby control of the Seattle company may pass to the Engineers' Public Service Company. The latter is a Stone & Webster subsidiary, and the Puget Sound Power & Light is under the executive management of that firm. (See "Financial and Statistical News," page 764.)

Purchase of the Cannon Beach (Ore.) electric utility by the Pacific Power & Light Company was recently made. This company and the Mountain States Power Company now supply virtually the entire Oregon coast-line territory between them.

The St. Joseph Lead Company is negotiating with the Union Electric Light & Power Company of St. Louis for the purchase by the latter of its power plant in southeast Missouri.

Application has been made to the Arizona Corporation Commission by the Ash Fork Light & Power Company for leave to sell its holdings to the Arizona Power Company. The latter plans to abandon the Ash Fork plant and to supply electricity from a connection, near Prescott, with its hydro-electric plants on Fossil Creek.

British Interests in Chile and Mexico Pass to America

A special dispatch to the New York *Times* under date of Oct. 9 says that Whitehall Electric Investments, Ltd., an English concern formed in 1922, has sold the whole of its important electrical investments in Chile and Mexico to the Electric Bond & Share Company of New York for a price substantially in excess of $50,000,000.

The sale was carried out, the dispatch says, through the American & Foreign Power Company.

When first incorporated the Whitehall Company acquired the controlling interest in several established companies operating in Chile and Mexico, the most important being the Cia Chilena de Electricidad, operating at Santiago. The following year the electric power, light and street-car system of Valparaiso and the hydro-electric station at La Florida, near Santiago, were acquired and the company also obtained interests in electrical enterprises in Tampico, Puebla, Vera Cruz and other Mexican cities.

Welders and Steel Treaters at Philadelphia

With a registration of more than two thousand at the end of the second day, the joint meeting of the American Welding Society, the American Society for Steel Treating and Institute of Metals combined to make this year's "national metal week" one of record size. Of particular interest to the electrical industry was the attention given in the technical sessions to the use of electric welding in manufacturing and the growing importance of electric furnaces for heat-treating processes. Some account of papers presented will be given in next week's issue. An important feature of the tenth National Metal Exposition, which was held in the Commercial Museum, was the extent of electric heat treating and control apparatus exhibited. Scheduled also for this week was the meeting of the industrial heating committee of the National Electric Light Association, which was to be held on Thursday.

World Fuel Conference Meets in London

American Engineers Take Part in What Proves a Well-Utilized Opportunity to Interchange Knowledge Accumulated in All Industrial Countries

From a Special Correspondent of the ELECTRICAL WORLD

LONDON, Sept. 28.

AT THE time of writing, the World Fuel Conference, organized by the British National Committee of the World Power Conference, is still in progress. The proceedings so far as they have gone have fully realized the aim of the organizers—that of providing an opportunity for the interchange of world knowledge on the subject of fuel, whether it be coal, oil or a derivative of either. Some idea of the interest which is being taken in the conference may be gathered from the fact that experts from no fewer than 49 countries are taking part in it, and that altogether about fifteen hundred delegates from all parts of the world are present.

The head of the American delegation, which consists of about twenty-five men, is O. C. Merrill, the executive secretary of the Federal Power Commission, while B. F. Haanel, chief engineer of the Division of Fuels and Fuel Testing, Department of Mines, is head of the contingent representing Canada.

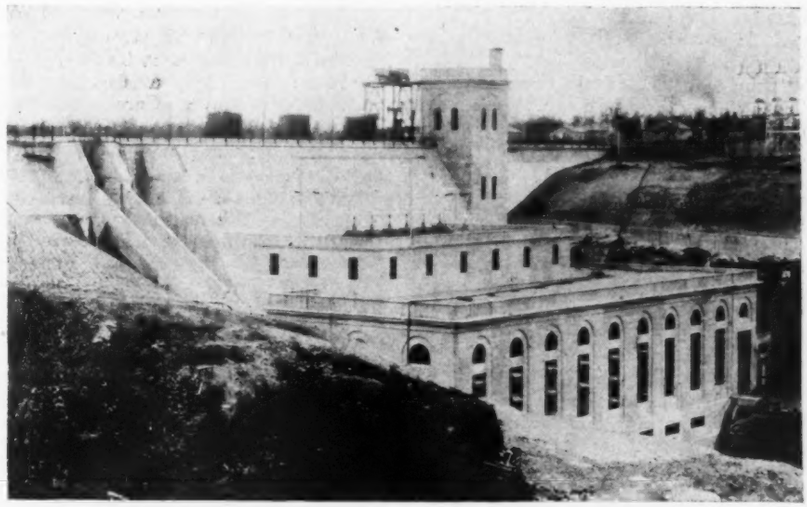
Among the papers contributed by Americans were the following: "Coal Cleaning," J. R. Campbell, American Rheolaveur Corporation, Scottdale, Pa.; "Production of Solid Smokeless Fuels," F. G. Tryon, Bureau of Mines; "Pulverized Fuel for Steam Purposes," Martin Frisch and Henry Kreisinger, Combustion Engineering Corporation, New York; "Oil Cracking," Dr. Gustav Egloff, Universal Oil Products Company; "Coke-Oven Practice and Developments in Bulk Carbonization," W. H. Blauvelt, New York; "Domestic Heating by Means of Solid Fuel, Oil, Gas and Electricity," O. P. Hood, Bureau of Mines, anonymous contributor representing the American Gas Association, and H. W. Derry, Union Gas & Electric Company, Cincinnati; "Utilization of Electricity for Industrial Heating," W. H. Sammis, Consumers Power Company, Jackson, Mich., and a member (name not available) of the A.I.E.E., and "Coal Classification," A. C. Fieldner, Bureau of Mines. No official list of attendants at the conference has been issued, but Americans whose presence is known by the writer are A. D. Bailey and John G. Learned of Chicago, D. B. Rushmore, George A. Orrok, H. W. Brooks, Martin Frisch and Dr. Egloff of New York, and O. P. Hood of Washington.

The proceedings began at the Imperial Institute on Monday, Sept. 24, when the president, the Marquess of Reading, took the chair, and Sir Robert Horne delivered the opening address, in which, after welcoming the delegates from overseas, he made a survey of the fuel problem and the scientific work in progress in many countries in connection with its economic utilization. He also briefly described the wide field of activities that is being covered in the proceedings of the conference. Brief speeches in response to the welcome were made by delegates from Germany, Canada, Japan and the United States, Mr. Merrill speaking for the country last named. On the same evening the official conference banquet was held, over which the Marquess of Reading presided and at which the principal guest was Sir Philip Cunliffe-Lister, who, as President of the Board of Trade, represented the British government.

The real work of the conference began on Tuesday and is being continued daily until Friday, Oct. 5. On most days both morning and afternoon sessions are held, the work of the different sections being carried on in separate halls of the Institute. This work is divided into twenty-one sections, a total of between 150 and 160 papers being presented. The first four sections cover every phase of the subject of coal—from its economic aspect to that of its storage, handling and use by the consumer. Altogether 28 papers are down for consideration in these sections. Canadian, German and British experts are making contributions to the coal carbonization section, while authorities from six countries are similarly dealing with gaseous fuels. The use of pulverized fuel is receiving attention in still another section, while the Diesel and other forms of internal-combustion engines are the subject of another group of nine papers.

Space will not allow reference to all the other sections concerned with various aspects of the fuel problem. From an electrical point of view chief interest lies in the sections dealing with the increasing use of high-pressure steam, one notable contribution being that of R. P. Sloan of the British Incorporated Association of Electric Power Companies on "The Economic Utilization of Fuels in the Production of Electricity." Another section deal-

New Development on Mattagami River, Ontario



OFFICIAL opening of the new enterprise of the Spruce Falls Power & Paper Company in northern Ontario took place recently. This project comprises a pulp and paper mill at Kapuskasing having a combined capacity of 600 tons daily, a power development of 75,000 hp. at Smoky Falls, on the Mattagami River, and 50 miles of transmission line between Kapuskasing and Smoky Falls, the whole linked to the Canadian National Railway system by 50 miles of standard-gage railway.

The power structures at Smoky Falls are all of solid concrete construction. In the main dam ten 40-ft. Stoney sluice-gates are provided to take care of the spring run-off. In its final form the power house will contain four units of 18,750 hp. each. At present three units are being installed and one is running.

Smoky Falls provides a natural head of 78 ft., which has been increased to 114 ft. The natural formation at Smoky Falls made an ideal site for a power development. An island divides the river into a gorge that is almost a ready-made tailrace and a wide and comparatively shallow series of rapids. The banks of the river are sufficient high to give a large water storage. A steel flume 17 ft. in diameter brings the water from the forebay at the head of the gorge to the power house below.

The towers for the 50-mile transmission line are 80-ft. high, spaced 800 ft. apart, and carry two aluminum circuits for transmission at 110,000 volts. The hydraulic equipment was supplied by the Canadian Allis-Chalmers, Limited, and the electrical equipment by the Canadian General Electric Company.

ing with the use of electricity for domestic purposes has brought contributions from Austria, Japan, Sweden and the United States.

Use of Peat in Russia

In the peat utilization section much interest has been aroused by a paper presented by the Soviet Russian Experimental Institute on Peat in which it was brought out that in several electric power stations in operation in Russia—including one with a capacity of 136,000 kw.—peat is being efficiently and economically used as the boiler-firing medium. In the section on transmission of power three out of four papers to be presented deal with gas. A noteworthy contribution, however, in that it surveys the whole field of power transmission, whether by the transport of coal or oil or the transmission of gas or electric power, is that presented by Dr. E. S. Smith, a British authority. One of the outstanding speakers at the conference so far has been Dr. Egloff, who in his paper on oil cracking definitely denied that there is any impending world shortage in oil supplies, there being, in his opinion, sufficient oil in sight in the United States alone to supply the world's requirements, including that for automobiles, for the next hundred years.

Apart from the papers and the discussions thereon, the conference is also notable for the large number of visits to British collieries and industrial establishments that have been arranged. The majority of these are to take place during the second week of the proceedings, and among those of chief interest from an electrical point of view are a visit to the superpower station of the County of London Electric Supply Company, at Barking, in the outer eastern London area, and that to the British National Physical Laboratory at Teddington. Finally, it may be mentioned that the social events in connection with the conference include a reception by Sir Philip Cunliffe-Lister on behalf of the British government and one by Lord Melchett and Robert Mond.

Farm Business Around Red Wing Increases Fivefold

The first of the experimental rural electric lines, built from Red Wing, Minn., in 1923 by the Northern States Power Company, is the basis of a report which the University of Minnesota is about to publish. The university report, Charles F. Stuart, chairman N.E.L.A. rural service committee, says, makes it clear that electricity liberally and intelligently employed on farms has been a very material and beneficial influence. The experimental lines are rapidly placing farm customers in the class of acceptable business.

"To the farmer the idea five years ago of paying $15 a month for electric service was something unthinkable," Mr. Stuart says. "He was making very limited use of service and there was nobody to show him how it could be more generally employed. The investigators found that everything on the farm was different from the city. The electric range built for city residence use was not acceptable for the farm home. Not only was there the house-heating problem to be taken into consideration but the ovens were not big enough to take care of the baking on the farm. There were mechanical problems also in applying electric power to farm chores. A farm implement is a low-speed machine and the motor a high-speed one. It all required a great deal of pioneer work, but that work, through the Red Wing and other experimental lines, is now pretty much past history.

"The electric light and power companies are rapidly taking care of the situation by the creation of rural electric service departments. The Northern States Power Company has such a department, which during the last two years has undertaken the guidance of approximately five hundred farm customers, most of them newly connected. The average consumption of these customers is now about 120 kw.-hr. per farm per month, which is almost five times the average obtained before these investigative projects began to yield results."

"Relighting Porto Rico"

Under the above heading *Porto Rico Progress* for Sept. 27 tells of the way in which the Porto Rico Railway, Light & Power Company worked to bring about resumption of service in the shortest possible time after the disastrous hurricane of a month ago. It says in part:

Without outside aid other than the employment of 200 or more laborers, the Porto Rico Railway, Light & Power Company staged a comeback after the storm that has been one of the marvels of these turbulent days. Within 48 hours after the storm wreckage was cleared away and lines were repaired to furnish power for the city pumping plant of San Juan, and at 11 o'clock Sunday morning power was available for the principal industries of the capital. There are three main lines leading into San Juan and all three were broken in many places. The linemen got around the difficulty by cutting back and forth on the three lines until current was carried by one and lights in sections where proper clearance had been effected were flashed on. No one had hoped to have light for at least ten days.

The first concern of Manager F. Krug was to furnish power for the city water plant of San Juan. Following temporary and makeshift arrangements to furnish power from the steam plant, workmen were set to work making repairs to restore service to normal, with the result that San Juan, Santurce and Río Piedras have 80 per cent normal service now with prospects of completion of all work next week.

All of Porto Rico is not so fortunate, however, as the capital city. In two communities the distribution system was utterly destroyed, and until major repair work is completed Humacao Playa and Yabucoa will have to wait for service. At Comerío floods worked havoc with the hydro-electric plants. One structure was completely demolished when the waters flowed completely over it and the other was inundated for hours. Much equipment is damaged and put out of order. The number of workmen at the plant has been augmented, and next week the first service line will be connected with the plant.

Nearly half the electric light poles were blown down, but less than 5 per cent will need to be replaced. In the field of street lighting the company fared very badly. The wind toyed with the loosely hung street-lighting fixtures, putting them out of commission and destroying them by the thousands. There are nowhere nearly enough fixtures on hand to make replacements. Orders have been cabled to the States, and in the meantime light is furnished by small lamps serving temporarily where the wind left a vacant connection.

Study of Power Generation at Navy Yards

A considerable increase in the power demand is one of the outstanding indications thus far of a survey now being made by the Bureau of Yards and Docks of the power requisites of the various navy yards. In explaining this increase naval officers point out that the greater use of electric welding equipment has added materially to the power consumption. Another factor is the gradual substitution of electrically operated air compressors for steam-driven apparatus. Surveys of the power plants at the Boston and Portsmouth navy yards have been completed already, and similar surveys at Philadelphia and New York are under way.

One of the principal reasons why the survey is being made, Rear Admiral Gregory, chief of the bureau, pointed out, is to standardize the methods of operation and accounting in practice at the various yards in order to provide a basis for comparison. It is believed that if the power plants can be put into competition with each other as far as performance is concerned, the task of devising means for saving part of the $3,000,000 it now costs the navy annually to operate these plants will be simplified.

It is freely conceded that one of the most important questions to be considered in power economy will be the advisability of using power from commercial power companies. The entire amount of central-station power now used is on the West Coast at the San Diego and Puget Sound naval stations. It is thought, however, that conditions are now such that power can be purchased advantageously at some of the Eastern yards. Whatever might be done in this connection the navy will protect and augment its power supply by retaining the use of its own equipment.

It has been found that the absence of the weight of rivets in electrically welded vessels is a considerable factor in promoting fuel economy. It is also pointed out that the two new aircraft carriers that are taking their place in service will add materially to the power loads at the navy yards. These vessels will consume nearly five times the amount of power required on the largest battleship. When they are put up at the yards with their engines dead they will be connected with the shore stations.

Briefer News

ARRANGEMENTS FOR 1930 WORLD POWER CONFERENCE IN BERLIN.—It is announced from Berlin that the German National Committee of the World Power Conference, which will be responsible for the plenary meeting in that city to be held June 16 to 25, 1930, has obtained the consent of Dr. Ing. V. Miller to act as honorary president.

ROCHESTER'S GROWING DEMAND.—Installation of a new 5,600-kw. General Electric steam turbine, the second unit to be added recently in response to demands for increased electrical power in the downtown district of Rochester, has been begun at the Lawn Street plant of the Rochester Gas & Electric Corporation. Steam pressure will be 375 lb.

PROJECT FOR PLANT ON MISSOURI RIVER IN SOUTH DAKOTA.—Reports in South Dakota newspapers indicate that a plan is under way to develop water power for industrial purposes from the Missouri River at a point in the vicinity of Oacoma. A preliminary survey has been made by J. E. Kirkham, former state bridge engineer, who has long believed that the Missouri River in South Dakota may become a profitable source of electrical energy.

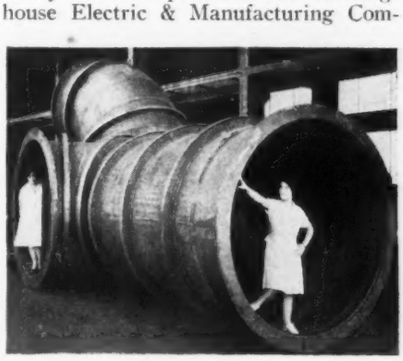
TEXAS-LOUISIANA POWER COMPANY IS BUILDING PLANT AT WHITEWRIGHT, TEX.—Construction has been started at Whitewright, Tex., on the power plant of the Texas-Louisiana Power Company of Fort Worth, which will supply energy for Whitewright, Trenton, Leonard, Celeste, Farmersville, Princeton, Blue Ridge, Tom Bean, Bells, Randolph and Bailey. The total expenditure for the power plant and transmission lines will approximate $250,000.

SOUTH TO HAVE ELECTRICAL INSPECTORS' ASSOCIATION.—The first meeting of the Southern Section of the International Association of Electrical Inspectors will be held on Monday morning, Oct. 22, in the auditorium of the New Orleans Public Service, Inc., for organization purposes. It is hoped that the organization can be launched with at least a hundred charter members. George Welman is the International Association's representative in the new Southern Section.

EMPIRE STATE METER SECTION MEETS AT ELMIRA NEXT WEEK.—Meeting at Rorick's Glen, Elmira, N. Y., on Oct. 18-19, the Electric Meter Section of the Empire State Gas and Electric Association will hold three sessions, the afternoon of the second day being devoted to inspection trips. W. T. Greene will discuss meter department organization under group management, A. J. Allen three-phase, four-wire metering and installation, J. N. Mayer outdoor residential metering, G. J. Roehrig checking phase angle and ratio of instrument transformers in the field, C. A. Mead the application of the oscillograph to metering problems, A. F. Kochendorfer two-phase, five-wire network metering, W. K. Dickinson bushing-type current transformers, and H. J. Klumb the prevention of meter tampering.

SEVEN SISTERS FALLS TO DEVELOP 135,000 HP. AND BE IN OPERATION IN 1930. — Following the information already printed in the ELECTRICAL WORLD that the Canadian government has granted a 30-year lease of the hydro-electric site at Seven Sisters Falls, Manitoba, to the Winnipeg Electric Company, that company, through A. W. McLimont, its president, has announced that the total development at this site will be 135,000 hp., that the project will cost $25,000,000 and that it is expected to be in operation in 1930.

"WORLD'S LARGEST" STEAM PIPE IS ARC-WELDED.—What is declared to be the "world's largest" steam pipe has recently been completed in the Westinghouse Electric & Manufacturing Company plant at South Philadelphia. It is 7 ft. in diameter and is composed of sections of rolled steel which are joined together by arc welding. It will carry 1,600,000 lb. of steam per hour at 40 lb. absolute pressure.



NEW HIGH-PRESSURE TURBINE FOR KANSAS CITY COMPANY.—The Kansas City Power & Light Company has purchased a turbo-generator from the Westinghouse Electric & Manufacturing Company for installation in its Northeast station. The unit consists of a 12,500-kva., 3,600-r.p.m., two-pole, 60-cycle generator coupled to a 12,500-kva., 1,200-lb. pressure turbine. Exhaust steam from the turbine is at approximately 310 lb. pressure and is heated to about 700 deg. before being used to drive the low-pressure unit at Northeast station. The present low-pressure steam unit is about 385 lb.

DOHERTY ORGANIZATION WILL MANAGE TENNESSEE EASTERN ELECTRIC COMPANY.—The Tennessee Eastern Electric Company of Johnson City, Tenn., has entered into a contract with the Cities Service Power & Light Company by which the Henry L. Doherty organization will take over the management of the Tennessee Eastern Electric and make its conduct uniform with that of the Bristol (Tenn.) Gas & Electric Company, a Doherty subsidiary. The Tennessee Eastern Electric has a hydro-electric development on the Nolichucky River, about 15 miles from Greenville, Tenn., and a steam plant on the Watauga River, about 3 miles from Johnson City. For several years it has been furnishing power and light to Johnson City, Greenville and Jonesboro. Its properties are valued at more than $6,000,000, exclusive of a proposed development at Hemlock Dam, at the junction of the Watauga and Holston Rivers, about 17 miles from Johnson City.

HARVARD, NEB., NOW VEERS TO MUNICIPAL PLANT.—The little city of Harvard, Neb., now served by the Southern Nebraska Power Company, where a typical fight between public and private ownership of the electric utility has been waged (ELECTRICAL WORLD, Aug. 4, page 230), has discontinued negotiations for a long-time franchise after refusing to recognize as legal the favorable vote of a majority of the electors and has awarded contracts for a complete generating and distributing system of its own. The power company has so far won the court fight.

MAYOR AND COUNCIL OF ANDERSON FIGHT OVER MUNICIPAL PLANT.—F. M. Williams, Mayor of Anderson, Ind., has vetoed an ordinance of the City Council appropriating $158,000 for a new turbo-generator of 10,000 kw. rating for the municipal light and power plant, a contract having been entered into with the American Brown Boveri Corporation for the turbine. The Mayor contends there is not sufficient need to warrant the expenditure and that eventually the city may be able to buy electricity cheaper than it can produce it. The bill may be again passed over his veto.

MISSISSIPPI POWER COMPANY TO BUILD 110-KV. LINE EXTENSION.—From Columbus, Miss., the announcement comes that the Mississippi Power Company will build a 110-kv. transmission line into northeast Mississippi, to be served from the Alabama system of the Alabama Power Company. This line will improve service to fifty towns and communities in Mississippi, including Columbus, Macon, Brooksville, Starkville, Aberdeen, Houston, Eupora, Calhoun City, Pontotoc, Baldwyn, Booneville, Corinth and Iuka.

NEW MERCURY UNIT TAKES LOAD.—The new mercury boiler and turbine installation at the South Meadow station of the Hartford Electric Light Company was brought up to speed on Oct. 4 and carried about 1,200 kw. for a short time. Heat was first put on the boiler Sept. 25, and one or two slight modifications were made prior to resuming operation last week. According to Vice-president T. H. Soren last week's initial operation proved entirely satisfactory and it was planned to continue putting the unit on the line for increasing periods and loads. The unit has a total rating of about 20,000 kw., of which half is in the form of steam for ordinary turbine service

and the remainder is energy delivered from the mercury-driven generator. Photographs of this unit taken during the construction period were published in the ELECTRICAL WORLD for Sept. 29 (pages 606 and 607.)

GRAND FALLS PLANT ON THE ST. JOHN RIVER, N. B., GOES INTO COMMISSION.—The 60,000-hp. hydro-electric plant of the St. John River Power Company, a subsidiary of the International Paper Company, situated at Grand Falls on the St. John River in the Province of New Brunswick, which was illustrated and briefly described in the ELECTRICAL WORLD for Sept. 15 (page 530), started operating last week almost simultaneously with the opening, noted last week, of the Paugan Falls (Quebec) hydro plant of the Gatineau Power Company, another International Power subsidiary.

SALT RIVER (ARIZ.) POWER DAM TO BE BUILT AT ONCE.—Final disposition of technicalities in connection with the issue of Stewart Mountain bonds brings the announcement that the electrification of the Salt River Valley in Arizona, comprising approximately 300,000 acres, will be completed before the summer of 1929. A power dam costing about $4,000,000 will be built on the Salt River below the present Mormon Flat Dam and will be used to generate power and for storage of irrigation water. This development will make electricity available to more than four thousand farmers. By means of an electrical show the Maricopa Electrical League will educate the farmers in rural electric service.

WATER-POWER PLANT AT GOSHEN PASS, VA., PLANNED.—Plans for construction of a dam at the head of Goshen Pass, Va., to utilize North River water power, have been submitted to the State Corporation Commission of Virginia for study pending an application for a license under the water-power law enacted by the last General Assembly. Floyd W. King, vice-president and general counsel of the applicant, the Virginia Public Service Company, says the plans will not mar the natural beauty of Goshen Pass, but, on the contrary, will enhance it through the creation of a lake four or five miles in length. Water to operate the plant would be diverted through a tunnel to a generating station at the lower end of the pass.

OLD FLAMBEAU MILLS RAISE POWER OUTPUT IN LAKE SUPERIOR REGION.—About 31,000,000 kw.-hr. will be added annually to the power reservoir of the Lake Superior District Power Company when work is completed on the conversion of three old mills on the Flambeau River into modern hydro-electric stations. The mills are at Thornapple, Port Arthur and Ladysmith dams in Wisconsin. They were purchased from the Great Western Paper Company, which formerly used them for turning its machines by direct power. The paper company has agreed to electrify its plant at Ladysmith, contracting for a minimum of 5,000,000 kw.-hr. a year. A transmission line is being run to the Thornapple site.

BRAZIL STARTS MARIMBONDO FALLS PLANT.—Marimbondo Falls, near São Paulo, Brazil, one of the largest hydro-electric plants in South America, was opened on Sept. 19 in the presence of a large crowd and began supplying electrical power to the vast Rio Grande River district. The Emprezas Electricas Brazileiras has recently been identified with the completion of the project. The potential capacity of the Rio Grande is estimated at 250,000 hp. The first unit has a capacity of 10,000 hp. only, but it is planned to add immediately sufficient generators to bring the production of the plant up to 40,000 hp.

PLANS FOR MEETING OF GREAT LAKES ENGINEERING SECTION.—The four-day meeting of the Great Lakes Engineering Section, N.E.L.A., at Jackson, Mich., on Oct. 24-27, is of unusual importance. In addition to the regular committee sessions, there will be an open meeting of the inductive co-ordination and overhead systems committees at which inductive interference, lightning investigations, overhead-line construction and other subjects will be treated by J. C. Martin. H. L. Wills, Frank F. Fowle, E. C. Stone and E. S. Lee. Inspection trips have been arranged by the Consumers Power Company and by the Commonwealth Power Corporation of Michigan, hosts to the meeting.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue for July 7, page 48.]

Empire State Gas and Electric Association — Electric Meter Section, Rorick's Glen, Elmira, N. Y. Oct. 18-19. C. H. B. Chapin, New York Central Terminal, New York.

Kansas Section, N.E.L.A. — Wichita, Kan., Oct. 18-19. H. Lee Jones, 401 National Reserve Bldg., Topeka.

American Engineering Council—Administrative board, Pittsburgh, Oct. 19-20. L. W. Wallace, 26 Jackson Place, Washington, D. C.

International Association of Municipal Electricians—Hotel Montelson, New Orleans, Oct. 22-26. H. N. Lang, Box 1864, Orlando, Fla.

Public Utilities Association of West Virginia—Hotel Pritchard, Huntington, Oct. 24-25. A Bliss McCrum, 514 Charleston National Bank Bldg., Charleston.

Engineering Section, Great Lakes Division, N.E.L.A.—Jackson, Mich., Oct. 24-27. L. F. Hickernell, Consumers Power Bldg., Jackson.

American Institute of Electrical Engineers — Regional meeting, Atlanta, Oct. 29-31. F. L. Hutchinson, 33 West 39th St., New York.

National Electrical Manufacturers' Association—Briarcliff Lodge, Briarcliff, N. Y., Oct. 29-Nov. 1. S. N. Clarkson, 420 Lexington Ave., New York.

Electrical Credit Association—Middle and Southern Atlantic States Division, Philadelphia, Nov. 1; J. W. Crum, 1211 Arch St., Philadelphia. Central Division, Palmer House, Chicago, Nov. 22-23; F. P. Vose, 1008 Marquette Bldg., Chicago. New York Division, New York, Dec. 17; W. J. Kreger, 261 Broadway, New York.

National Electrical Wholesalers' Association—Chicago, Nov. 12-16. E. Donald Tolles, 165 Broadway, New York.

National Association of Railroad and Utilities Commissioners — New Orleans, Nov. 13-16. J. B. Walker, 270 Madison Ave., New York.

Public Utilities Association of Virginia—Hotel Roanoke, Roanoke, Va., Nov. 21-22. A. B. Tunis, 301 East Grace St., Richmond, Va.

TAXATION OF MUNICIPAL UTILITIES SUGGESTED IN OREGON.—When the Oregon Legislature convenes next January it will be asked to consider an amendment to the state constitution to enable counties and school districts to tax municipally owned utilities. A recommendation will also be submitted for an amendment to the Public Service Commission laws which will authorize this department to exercise regulatory jurisdiction over civic utilities. These measures are being proposed by the state tax relief committee, which contends that also the state government should have a reliable check on municipal utilities by means of a uniform accounting system.

PURDUE HOLDING SECOND RURAL SERVICE COURSE.—The agricultural engineering department of Purdue University, Lafayette, Ind., announces that its second annual agricultural short course for rural service men will be held at the university under the direction of the Agricultural Experiment Station, in co-operation with the Indiana Electric Light Association, on Oct. 17 to 19. C. V. Sorenson, Prof. C. F. Bowman, Dr. E. A. White, Marshall E. Sampsell, E. L. Hinchliff and E. R. Meacham are among industry experts well known in Middle West electrical circles who will address the class.

NEW DAM ON ROGUE RIVER, ORE., OPPOSED BY POWER COMPANY.—Court action has been instituted by the California-Oregon Power Company for the purpose of permanently enjoining the Beaver-Portland Cement Corporation from reconstructing a power dam on the Rogue River near the town of Gold Hill, Ore., on the ground that such construction will result in serious injury to lands and properties in the vicinity of the dam location which belong to the plaintiff. The town of Gold Hill originally owned and operated a hydro-electric plant which was later leased to the Beaver-Portland Cement Corporation.

HOUSTON TO HAVE A COMPANY "CENTER."—Surrounding a 66,000-volt substation which the Houston Lighting & Power Company will construct in Magnolia Park, a suburb of Houston, will be the first unit of a business and recreation center. The total cost of these improvements will be $300,000. The center will include warehouses, offices, a recreation building, lounges, garages, an emergency hospital, an auditorium, an experimental laboratory, a recreation park and the substation. The company's generating plant at Deepwater is being enlarged by the installation of new equipment to cost $3,500,000.

Inductive Co-ordination

Rules Adopted on This Matter by California Commission and Called the "California Method" Are Explained by President Whitsell

REMARKABLE success for what has been called the "California method" of adjusting difficulties between public utility corporations resulting from inductive interference by electric power lines with telephone, telegraph or other utility lines was claimed by President Leon O. Whitsell of the California Railroad Commission recently before the American Railway Association at San Francisco. He said in part:

The earliest case of inductive co-ordination—or, as we then called it, inductive interference—came to the commission's attention about fifteen years ago, when the Pacific Telephone & Telegraph Company filed a formal complaint against the Sierra & San Francisco Power Company and the Coast Counties Gas & Electric Company and Great Western Power Company, in an effort to prevent the paralleling of one of its main toll leads by 20,000-volt and 60,000-volt power-transmission lines in the then developing territory south of San Francisco Bay.

The telephone company was already experiencing considerable difficulty on its main toll lead north of San Francisco, due to the paralleling by 30,000-volt and 60,000-volt power lines, and when it began formal action the situation carried with it every indication of a costly and bitter contest, a finish fight as it were, between the opposing utilities.

In the new and peculiar matter thus brought before it the commission recognized that both of the utilities involved were rendering a public service, and that the impending conflict between them grew out of the desire on the part of one to maintain and improve its service and the desire on the part of the other to make its service available to a large area that up to that time had not received the benefits of electric power. The commission realized that this was not merely a dispute between two contending corporations, but rather a question of availability and quality of two essential types of public utility service and that, in spite of prior occupancy, franchise rights, legal precedents and the relative ability and resourcefulness of counsel, the public interest demanded that both the new and the existing lines operate as satisfactorily and economically as possible.

Fortunately, both parties to the case were broad-minded, and they too recognized these controlling conditions and obligations and a spirit of constructive accomplishment prevailed over one of fruitless argument and destructive delay. A conference of the engineers of the opposing interests was called and, as is often the case, these engineers decided that an investigation would be necessary before they would really be in a position to analyze the problem intelligently.

The result was the formation of a joint committee headed by the engineering department of the Railroad Commission and consisting mainly of representatives of the various transmission, communication and power companies of the state. This committee was called the joint committee on inductive interference.

In carrying on the work, the larger companies furnished men and equipment and financial support for a very extensive series of field tests and theoretical studies. This investigation extended over a period of nearly five years, during which a great number of experiments were conducted on actual commercial lines and a complete field laboratory was set up in three different locations in the state. It is stated that the total cost of this work was in the neighborhood of $100,000.

The committee completed a very large and pretentious report, which recommended the promulgation of certain general rules for the mitigation or prevention of inductive interference.

Accepting the recommendation of the committee, the Railroad Commission embodied those rules in a general order, and the first two rules in that order epitomize the conclusions of the committee and the order itself. The first of them is:

"*Co-operation.*—Any party contemplating new construction which may create a parallel shall confer with the other party or parties concerned, and they shall co-operate with a view of avoiding the parallel or, if this be impracticable, of minimizing the resulting interference. Failure to comply with this requirement will receive consideration by this commission in any subsequent issue involving such construction."

The second rule reads:

"*Principle of Least Cost.*—When there are two or more different practicable methods of avoiding or mitigating interference, the method which involves the least total cost shall in general be adopted, irrespective of whether the necessary changes are made in the plant of the party creating the parallel or in the plant of the other party."

Commission Rulings

UTILITY WITH MORE THAN ONE BUSINESS MUST KEEP ITS DEPARTMENTS ON SEPARATE BASIS.—The Wisconsin Railroad Commission refused to allow the city of Kewaunee to retain electric rates found to be high merely because the city's water department was operating at a loss. The commission held that the fact that a municipality runs both an electric and a water plant does not relieve it from the necessity of maintaining the operation of the two departments on an absolutely separate basis. The customer who uses water and the customer who uses electricity should each pay for his own service, the commission declared. Even though the two assumed individuals may be, and probably are in most cases, the same man, the distinction in law must be preserved.

PURCHASERS OF ENERGY SHOULD NOT BE REQUIRED INDIRECTLY TO HELP MINING INDUSTRY.—The Scranton Mining Company of North Dakota, an unprosperous concern, decided to use a new process for drying coal which it was believed would help the company dispose of its surplus commodity in the generation of electrical energy. The Scranton Electric Company, a subsidiary already formed, accordingly applied to the Board of Railroad Commissioners of the state for permission to construct and operate an electric plant with this plan in view. The Montana-Dakota Power Company had filed an application for the same territory. The commission was convinced that the latter could probably give better service at more reasonable rates, and, while regretting that it could not aid the development of the mining industry, said: "The commission does not believe that the people in those communities through unduly high electric light rates should be required to bear the burden of building up a mining industry which is dependent upon the partial drying of the coal, which process at this time has not passed the experimental stage."

Recent Court Decisions

POWER WIRES STRUNG WITHOUT LOT HOLDER'S CONSENT CEASED TO BE NUISANCE WHEN HOUSE WAS WIRED WITH SUCH CONSENT.—Coons vs. New York Telephone Company concerned a suit for damages for the death of a man installing a radio aërial which came into contact with a high-tension line attached to a telephone pole at the foot of the lot where the work was being done. It was shown that in 1911 the telephone company erected the pole and put its wires on it with the consent of the owner of the lot, on which there was a dwelling house; that in 1919, without the consent of this owner, the telephone company allowed the Buffalo General Electric Company to fasten high-tension wires to the top of the pole, and that it was from these the fatal shock came; that in 1921 the tenant on the premises was permitted by their owner to wire the house for electricity, at which time the central-station company used the power wires already strung, and that since that time electricity has been steadily supplied. The Court of Appeals of New York, reversing a verdict for the plaintiff, held that the high-tension wire, though originally it may have been illegally installed and a nuisance, ceased to be so when the lot owner approved of the electrical installation in 1921. (162 N.E. 578.)*

FAIRBANKS-MORSE COMPANY FREE TO SELL ITS ENGINES IN OCCUPIED TERRITORY.—A controversy over the right of Texas municipalities to construct and operate their own public utility plants in territory developed and occupied by private enterprises was involved in two injunction proceedings before the United States District Court at Dallas. One case affected the town of Commerce and the other the town of Seymour. The Texas Power & Light Company had obtained temporary injunctions restraining the Fairbanks-Morse Company from selling equipment for municipal light and power plants to the towns named. In upsetting this prohibition the District Court said: "Of course, you cannot prevent a company from selling its goods wherever it chooses, and the injunction in that respect is dissolved. The Fairbanks-Morse Company has the right to sell its machinery in any part of Texas so long as it does not attempt to dissatisfy the customers of the Texas Power & Light Company with the service given its present customers." The Fairbanks-Morse Company contended that it had made no attempt to dissatisfy the customers of the Texas Power & Light Company, but had been solicited by the citizens of Commerce and of Seymour to sell them light and power machinery. The Fairbanks-Morse Company contended that the District Court injunctions would have run them out of Texas.

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Men of the Industry

New England Power Personnel Reorganized

An executive order establishing the responsibilities of various officials of the New England Power Association has been issued by S. C. Moore, general manager, as follows: C. S. Herrmann, treasurer, will be in charge of all financing, auditing and accounting of the association and its subsidiaries; F. J. Dunn, general counsel, will be in charge of all legal matters; Mr. Moore will be in charge of the United Electric Railways, Providence, and A. E. Pope, vice-president of the association, will be in charge of all operations. Under Mr. Pope the following personnel will perform duties: C. R. Oliver, assistant vice-president, will be in charge of personnel and maintenance of all steam and hydro plants, transmission lines and substations and will be general manager of the New England Power Company, Connecticut River Power Company and Rhode Island Power Transmission Company; W. R. Bell, formerly operating engineer, has been made assistant vice-president in charge of system operation, including load dispatching and studies, operating economies and operating engineering; H. T. Pierce will be chief engineer in charge of engineering, and Hugo Rocktashel will be sales manager in charge of wholesale power sales; Mr. Pierce will be in charge of all construction, acquisition of lands and rights-of-way; R. E. Shillady, as purchasing agent, will be in charge of all purchasing for the association. W. C. Bell, vice-president of the association, will be in charge of retail distribution, and to him will report all managers of distributing companies, the sales manager, Mr. Rocktashel (with respect to large power sales in the territory of the distributing companies), and Hugh F. Lovering, editor of *Contact*. H. O. Wells, formerly of the purchasing organization, will be assigned to special work under the direction of the general manager.

Messrs. Herrmann, Dunn, Pattee (general attorney), Pope, W. C. Bell, H. T. Pierce (as to construction) and Wells will report directly to the general manager and to the president.

WILLIAM L. ABBOTT, chief engineer of the Commonwealth Edison Company, has been elected president of the Fourth Midwest Power Engineering Conference, to be held in Chicago next February. A leader among the power specialists of the country, Mr. Abbott is well qualified to direct the work of this conference. He has been connected with the Commonwealth Edison Company for 42 years and is thoroughly familiar with the generating, distributing and utilization problems of that section of the country. He has done effective committee work in the National Electric Light Association and the American Institute of Electrical Engineers and is a past-president of the American Society of Mechanical Engineers and the Western Society of Engineers. Mr. Abbott has read many papers before these associations and has been a frequent contributor to the technical press.

N. L. Mortensen Named Chief Engineer of Cutler-Hammer

N. L. Mortensen, who has been connected with the Cutler-Hammer Manufacturing Company, Milwaukee, Wis., for 21 years, has been appointed chief engineer of that organization. T. E. Barnum, formerly chief engineer, has

N. L. Mortensen

been appointed consulting engineer, in which position he will be able to give uninterrupted attention to engineering problems and outside engineering relations. Mr. Mortensen was born in Denmark and received his technical education there and in Germany. His versatility as a control engineer has long been recognized by United States industry. Articles by him have appeared frequently in the technical press and he has delivered numerous papers before electrical societies. He is a fellow of the American Institute of Electrical Engineers and a member of the Association of Iron and Steel Electrical Engineers. He assumes the duties of his new position after serving for five years as assistant to Mr. Barnum.

Mr. Barnum, who has been chief engineer since 1906, first affiliated himself with the Cutler-Hammer organization in 1898 as engineer. Four years later he was appointed assistant chief engineer and in 1906 chief engineer. Mr. Barnum's early experience was obtained with the General Electric Company at Lynn, Mass., the Chicago Edison Company, the Crane Elevator Company and the American Rheostat Company, Milwaukee. Mr. Barnum is a fellow of the American Institute of Electrical Engineers, a member of the American Society of Mechanical Engineers and serves on the board of governors of the National Electrical Manufacturers' Association.

C. N. POSEGATE, formerly railroad engineer of the Illinois Commerce Commission, has been appointed chief engineer to succeed C. G. Bennett, resigned.

KENNETH H. WEYERBACHER, president and general manager of the Boonville Electric Light & Power Company, Boonville, Ind., has been elected vice-president of the First National Bank at Boonville.

J. N. FUNDERSHAUG of Chicago has been appointed general superintendent at Bismarck, N. D., of the United Public Service Company. He will be in charge of general operation and construction.

DR. ROBERT A. MILLIKAN has recently received the Messel medal, which is awarded every alternate year for the most meritorious scientific work of the two previous years. The last award was made to Lord Balfour, in 1926. Doctor Millikan received the medal from Francis H. Carr, British president of the Society of the Chemistry Industry.

ROY A. PALMER, for the past seven years a member of the engineering and research staff of the National Lamp Works of the General Electric Company, has affiliated himself with the Southern Public Utilities Company and the North Carolina Public Service Company in the capacity of illuminating engineer. Mr. Palmer is a native of Minnesota and was graduated from the University of Minnesota in 1921 in electrical engineering. Immediately after graduation, he entered the engineering department of the National Lamp Works, where his duties included the design of lighting installations, work on technical bulletins in lighting, lectures and demonstrations before groups interested in better lighting and editing the *Engineering Department News*, the official paper covering the progress in lighting and new developments in lighting equipment. Mr. Palmer was called upon to act as field director in the Middle West during the industrial lighting campaign conducted under the auspices of the National Electric Light Association three years ago. He has written extensively on lighting and related subjects, his articles having appeared in a number of technical and trade journals.

H. R. STERRETT, formerly president of the Des Moines (Iowa) Gas Company, has been appointed regional vice-president of the Philadelphia Suburban-Counties Gas & Electric Company, in charge of electric and gas operations in the main line division, with headquarters at Ardmore, Pa. Mr. Sterrett was born in Philadelphia and received his technical training at the University of

Pennsylvania, from which institution he was graduated in 1911. Since that date he has been employed by the United Gas Improvement Company or subsidiary companies. Mr. Sterrett was treasurer of the Iowa Committee on Public Utility Information until his recent transfer to the East.

SAMUEL HORELICK, formerly chief engineer of the Pittsburgh Transformer Company from 1915 to 1927 and later connected in a similar capacity with the Allis-Chalmers Manufacturing Company, Pittsburgh Transformer Works, resigned his position Oct. 1. Mr. Horelick is a graduate of Carnegie Institute of Technology, class of 1912. He has to his credit a large number of patents, among which are the Pittsburgh polyphase transformer and the Pittsburgh film type radiator, which are well known to the industry.

JOHN ADEY, formerly connected with the Iowa Light & Power Company at Oskaloosa, Iowa, has been transferred to Montezuma, where he has charge of the company's division.

ARTHUR H. TWEEDIE, Hamilton, Ont., has been appointed to the position of superintendent of the new power plant of the Saint John River Power Company at Grand Falls, N. B.

L. C. MORROW, managing editor of *American Machinist*, a McGraw-Hill publication, has been appointed editor of *Industrial Engineering*, which is also published by the McGraw-Hill Publishing Company. Mr. Morrow will assume his new duties Nov. 1. A graduate of the University of Cincinnati in mechanical engineering, Mr. Morrow had several years of industrial plant experience before joining the editorial staff of *American Machinist* in 1920.

HAROLD E. NORTON of Dallas, Tex., has been given charge of the Pacific Coast sales division of W. B. Foshay Company with headquarters in San Francisco. He is succeeding C. H. Burnworth, who has resigned to go into business for himself. Mr. Norton's new work with the Foshay organization will give him direct supervision of sales offices in San Francisco, Los Angeles, San Diego, Stockton, Cal.; Portland, Ore., and Seattle, Spokane and Bellingham, Wash.

MERRITT C. HUSE, who was appointed early this year sales manager of the Philadelphia Electric Company, has just been appointed to the same position with the Philadelphia Suburban-Counties Gas & Electric Company. Mr. Huse has been connected with the Philadelphia Electric Company since 1917 and before assuming the duties of sales manager was assistant to C. J. Russell, vice-president in charge of the commercial department.

BERNARD LESTER, assistant industrial sales manager of the Westinghouse Electric & Manufacturing Company, has been placed in charge of the company's business relationships with architects, builders, building contractors and manufacturers of machinery and motor-driven appliances. His headquarters are in New York. Mr. Lester has been identified with the Westinghouse company for more than twenty years and is widely known in industrial circles. He was graduated from Haverford College in 1904, and assumed charge of the Westinghouse small-motor department shortly afterward. In the course of his career he has devoted himself to the study of the economic application of electric power for industrial and domestic purposes.

F. R. Fishback Elected Vice-President of N.E.M.A.

F. R. Fishback, president of the Electric Controller & Manufacturing Company, Cleveland, Ohio, has just been elected vice-president in charge of the apparatus division of the National Electrical Manufacturers' Association, according to an announcement made by

F. R. Fishback

Alfred E. Waller, managing director of the association. Mr. Fishback was elected to the office of vice-president of N.E.M.A. at a meeting of the executive committee of the board of governors. He replaces N. A. Wolcott, resigned.

Mr. Fishback's business experience with the Electric Controller & Manufacturing Company has been on the commercial side. He has held the position of sales manager and in 1924 was appointed vice-president and secretary. The following year he was elected president, which position he now holds. As vice-president of the apparatus division of N.E.M.A., Mr. Fishback will represent a group which includes about 85 per cent of all the manufacturers of electrical apparatus and machinery in the country.

F. E. BRYANT, superintendent of the Indianola, Iowa, municipal light and water plant, has resigned his position. Walter Jergeson is temporarily in charge of the plant.

SAM S. HALEY has been appointed associate general counsel for the Missouri Public Service Commission by Gov. Sam Baker to succeed J. P. Painter, who, as announced in the Sept. 29 issue of the ELECTRICAL WORLD, was appointed a member of the commission. Mr. Haley was formerly federal prohibition administrator for Missouri.

DRAYTON A. MAYERS, formerly connected with the General Electric Company, the Robertson-Cataract Electric Company and more recently with the Standard Gas Equipment Company, has joined the Columbia Gas & Electric System and will have charge of the new-business department for the Charleston operating group.

E. A. BROFOS, vice-president of the International Electric Corporation, has recently been made a Knight, First Class, of the Order of Saint Olav by the King of Norway in recognition of his services to Norwegian industry and public and private telephone communication interests in Norway. Mr. Brofos is a member of the American Institute of Electrical Engineers.

Obituary

ROBERT LAIDLAW, founder of Laidlaw & Dunn, now the Worthington Pump & Machinery Company, died Oct. 6 at Brockville, Ont., in his eightieth year. Mr. Laidlaw was active in business and civic circles in Cincinnati, Ohio, until his retirement in 1899. He was at one time superintendent of the water works in Cincinnati and later, with his brother and J. W. Dunn, he operated for many years the firm of Laidlaw & Dunn.

ROBERT V. PRATHER, secretary of the Great Lakes Division of the National Electric Light Association and secretary-treasurer of the Illinois State Electric Association, the Illinois Electric Railway Association and the Illinois State Gas Association, died suddenly Oct. 7 in St. Louis. Many utility men of prominence attended the funeral and messages of condolence were received from all sections of the country. Mr. Prather was born in Claremont, Ill., 44 years ago. In 1914 he was appointed secretary of the Illinois Public Utilities Commission by Governor Dunn and since that time has made his home in Springfield. He resigned from the Public Utilities Commission early in 1918 and it was through his executive ability that the three associations, Gas, Electric and Railways, were combined and he was made secretary. Under his direction one joint convention has been held each year since the consolidation. Mr. Prather just issued a call for a meeting of the presidents of the three associations to be held on the 18th of this month to decide the time and place for the convention for 1929. He served on several committees of the national association and was nationally known in the utility field. Mr. Prather, in association with Ben Lyons, purchased the Kewanee Public Service Company and operated it for some time before selling it to the Illinois Power & Light Corporation.

Financial and Statistical News

Power and Light Stocks Near Year's High

POWER and light stocks have been less prominent than usual in this week's trading, but continued firmness in the face of market reverses gives further evidence that there is no lack of confidence in the utilities. The average of a representative group of fifteen power and light stocks is practically at the previous high of 157, against 115 for the same group at this time last year, and a low of 121 this year.

A feature of this week's securities business which has some significance is the liquidation on the part of member banks of the Reserve system. The report, which represents 634 banks in leading cities, shows a reduction of $101,000,000 in investments. Of this, $40,000,000 represents the sale of government securities and $61,000,000 that of other bonds and stocks. While such liquidation on the part of the banking institutions may be interpreted as highly significant in certain investment quarters, the majority of the investing public are apparently still buyers.

Gatineau Power Makes Additional Offering

The Gatineau Power Company made an offering of first mortgage gold bonds, priced at 97¼ and accrued interest to yield over 5.18 per cent. These 5 per cent securities were dated June 1, 1926, and mature June 1, 1956. The Gatineau Power Company is one of the principal power units in the International Paper Company system and one of the largest hydro-electric producers on the North American continent. The company's hydro-electric developments have a total capacity now operating or nearing completion of 544,300 hp. and a potential capacity, including undeveloped power, in excess of 1,100,000 hp. and are located within economic transmission distance of the largest markets for power in the Dominion of Canada.

North American System Reports Record

New high records in electric power output of the North American Company's subsidiaries for three quarters of 1928 indicate a continued upward curve of industrial activity. Output for the third quarter was 1,572,800,000 kw.-hr., an increase of 16.5 per cent over the same period of 1927. Total output for three quarters of this year was 4,405,000,000 kw.-hr., an increase of 14.5 per cent over three quarters of 1927.

"These increases in the use of electricity are a close gage of prosperity," said Frank L. Dame, president of the North American Company, "because they represent the energy sold by the same companies during 1928 and 1927 to more than 1,000,000 customers, including widely diversified industries in California, Missouri, Illinois, Iowa, Ohio, Wisconsin, Michigan and the District of Columbia."

Consistent gains by the North American System are shown as follows, in millions of kilowatt-hours:

	1928	1927	Increase, Per Cent
First quarter	1,334.5	1,189.8	12.2
Second quarter	1,497.7	1,305.3	14.7
Third quarter	1,572.8	1,350.6	16.5
Total	4,405.0	3,845.7	14.5

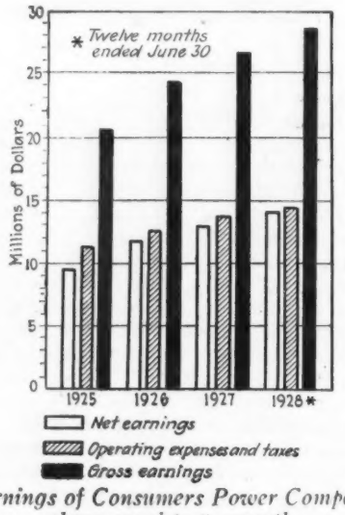
Utility Securities Added to Legal Investment List

The following securities of electric light and power companies have been added to the list of legal investments for savings banks, according to Frank H. Warder, Superintendent of Banks of the State of New York:

Central Hudson Gas & Electric Company first and refunding 5s, 1957; Duke Power Company first and refunding 4½s, 1967; Empire District Electric Company first and refunding 5s, 1952; Ozark Power & Water Company first 5s, 1952.

Consumers Power Company Financing at Low Rates

IN THE first six months of 1928 the Consumers Power Company expended more than $6,000,000 for property additions and extensions, and according to present plans a similar sum will be required to make the improvements necessary to provide for the future growth of the business. With this objective in view the stockholders at a meeting held Aug. 7 authorized an increase of 250,000 shares of preferred stock without par or face value, to rank equally with previously authorized preferred stock. Recently a series of $5 cumulative preferred stock was created without par or face value, with dividends payable quarterly on the first days of January, April, July and October, entitled, upon dissolution, to $100 per share and accrued dividends and callable upon 60 days' notice at 105 and accrued dividends. All the stockholders have been given an opportunity to purchase this stock at $95 per share and accrued dividends to date of payment.



Earnings of Consumers Power Company show consistent growth

The Consumers Power Company, the largest subsidiary of the Commonwealth Power Corporation, owns and operates an extensive system of electric and gas properties in Michigan. The facility with which this utility company is able to finance its expansion work through stock bearing interest at the rate of only $5 speaks well for the future possibilities of the company in the way of new developments. In addition to the proceeds from the sale of this stock the Consumers Power Company has also received funds for property development from its parent company in exchange for 40,000 shares of common stock.

New Developments Under Way

The capacity of the company's Saginaw River steam plant was increased by 30,000 kw. in April this year. In addition work has been started to install at that plant a fourth unit of 35,000 kw., which will probably be placed in operation next summer. The present capacity of this plant is 70,000 kw. When the fourth unit is completed the capacity will be 105,000 kw. At the Grand Rapids steam plant work is in progress on the installation of a unit with an additional 20,000 kw. According to present plans this unit will be in operation late next year, making the installed generating capacity 42,000 kw.

Gross earnings of the company for the year 1927 increased $2,476,972, or 10.26 per cent over 1926. The proportion of earnings derived from the electric department amounted to 77 per cent of the total, from the gas department 21 per cent and from the heating and water departments 2 per cent. After deducting operating expenses and taxes from gross earnings, the gross income for the year showed an increase of 9.56 per cent over 1926. A more substantial increase would have been recorded had it not been for continued increases in taxes.

In 1927 the taxes totaled $2,759,814,

an amount equivalent to 10.33 cents out of every dollar of income received. After deduction of interest and other fixed charges the net income available for dividends and for property retirements amounted to $10,336,441, an increase of 12.87 per cent over the previous year. Sales of electricity totaled 740,267,389 kw.-hr., an increase of 15.19 per cent over 1926, and electric customers increased from 243,683 in 1926 to 263,097 in 1927.

Standard Gas & Electric Earnings Up

CONSOLIDATED earnings of the Standard Gas & Electric Company and subsidiary and affiliated companies for the twelve months ended June 30, 1928, after deduction of preferred dividends and all prior charges, showed a balance of $8,780,754. This is equal to $6.55 a share on the average number of common shares of the Standard Gas & Electric Company (1,340,077) outstanding during the period and $6.18 a share on the common stock (1,418,904 shares) outstanding on June 30, 1928. The balance for the previous twelve months was equal to $5.09 a share on the stock (1,247,498 shares) outstanding on June 30, 1927.

Collectible earnings of the Standard Gas & Electric Company for the twelve months ended June 30, 1928, after deduction of preferred dividends and all prior charges, showed a balance of $6,718,789. This is equal to $5.01 a share on the average number of shares of common stock (1,340,077) outstanding during the period and $4.73 a share on the common stock (1,418,904 shares) outstanding as of June 30, 1928, comparing with $6,207,299 for the previous twelve months, or $5.01 on the average number of shares (1,238,969) outstanding during that period and $4.97 a share on the common stock (1,247,498 shares) outstanding on June 30, 1927.

After payment of cash dividends amounting to $4,689,619 on the common stock during the twelve months ended June 30, 1928, a balance of $2,029,170 was carried to surplus for the period, as compared with a surplus of $1,569,323, after payment of cash dividends of $4,021,476 and stock dividends of $616,500 during the previous twelve months.

Combined net earnings of all subsidiary and affiliated public utility companies of the Standard Gas & Electric Company for the twelve months ended July 31, 1928, showed an increase of $3,720,121, or 6.10 per cent, as compared with the previous twelve months. Gross earnings increased $5,920,759, or 4.27 per cent. The figures for all companies now in the system compare as follows:

Twelve Months Ended July 31:	1928	1927
Gross earnings	$144,688,386	$138,767,626
Net earnings	64,673,086	60,952,965
Other income	2,804,787	2,644,817
Net earnings including other income	67,477,873	63,597,782

Gross and net earnings of individual companies compare as shown in the table below.

Long Island Lighting Plans New Financing

Financing by the Long Island Lighting Company is expected at an early date, involving the issuance of about $2,000,000 in 6 per cent cumulative preferred stock at a price above par value of $100. According to present plans one-half of this amount will be sold directly to customers of the company in the territory served, and the balance will be offered by a banking syndicate publicly here.

The proceeds of this financing are to be used for new construction work and for other corporate purposes. Among the developments already in progress are the construction of new transmission lines and the erection of transformers to take care of the steady growth in population on Long Island and the increasing number of homes to be served.

The financing will also pay part of the costs of the new 100,000-kw. plant which the Long Island Lighting Company is building at Glenhead, where there is already an older 15,000-kw. plant in existence. The first section of the new plant will have a capacity of 25,000 kw. Another new power plant under construction in Queens, in the territory of the Queens Borough Gas & Electric Company, a subsidiary, will provide additional power for the electric system extending over the Fifth Ward of Queens and the southwestern part of Nassau County.

Two Public Utility Issues Offered

Secured gold debentures of the American Community Power Company to the amount of $5,000,000 were offered during the week ended Oct. 10 at 94½ and accrued interest, to yield over 5.90 per cent. These securities were dated July 2, 1928, and mature July 1, 1953. They will be a direct obligation of the company and will be secured by the pledge of all of the outstanding common stocks of the Community Power & Light Company and, with the possible exception of 100 shares, General Public Utilities Company. These debentures are followed by 30,000 shares of first preferred stock, 40,000 shares of preference stock and 50,000 shares of common stock.

With the purpose of acquiring 300,000 shares of junior preferred stock of the Puget Sound Power & Light Company the Engineers Public Service Company issued 130,000 shares of $5.50 cumulative dividend preferred stock at 99½ flat, to yield 5.52 per cent.

MOLONEY ELECTRIC DECLARES INITIAL DIVIDEND.—Directors of the Moloney Electric Company have declared an initial quarterly dividend of $1 per share on the class A stock, no par value, payable Oct. 15 to holders of record Sept. 30.

NEW HAVEN UTILITY TO VOTE ON STOCK INCREASE.—The United Illuminating Company, New Haven, Conn., is planning a meeting of stockholders Oct. 22, at which a proposed capital increase will be voted. The directors have recommended an increase from $600,000 to $650,000. The ratio is one to twelve.

Twelve Months Ended July 31:	1928	1927
The Callfornia Oregon Power Company		
Gross earnings	$3,099,368	$2,756,227
Net earnings	1,952,769	1,655,854
Other income	16,384	6,794
Net earnings including other income	1,969,153	1,662,648
Fort Smith Light & Traction Company		
Gross earnings	$990,740	$951,163
Net earnings	292,757	251,534
Other income	113,416	97,154
Net earnings including other income	406,173	348,688
Louisville Gas & Electric Company		
Gross earnings	$9,465,634	$8,655,678
Net earnings	4,896,593	4,434,394
Other income	239,629	149,066
Net earnings including other income	5,136,222	4,583,460
Market Street Railway Company		
Gross earnings	$9,857,675	$9,853,537
Net earnings	1,496,066	1,762,595
Other income	20,284	32,568
Net earnings including other income	1,516,350	1,795,163
Mountain States Power Company		
Gross earnings	$2,826,435	$2,691,668
Net earnings	1,056,992	1,062,598
Other income	100,349	186,321
Net earnings including other income	1,157,341	1,248,919
Northern States Power Company		
Gross earnings	$30,786,418	$29,133,589
Net earnings	15,522,617	15,010,206
Other income	291,247	83,726
Net earnings including other income	15,813,864	15,093,932
Oklahoma Gas & Electric Company		
Gross earnings	$11,010,030	$8,331,684
Net earnings	5,077,966	3,960,324
Other income	486,814	932,726
Net earnings including other income	5,564,780	4,893,050
Philadelphia Company		
Gross earnings	$61,270,418	$61,472,661
Net earnings	26,767,098	26,114,949
Other income	1,488,731	1,102,080
Net earnings including other income	28,255,829	27,217,029
San Diego Consolidated Gas & Electric Company		
Gross earnings	$6,644,878	$6,407,029
Net earnings	3,135,348	2,949,852
Other income	3,660	5,815
Net earnings including other income	3,139,008	2,955,667
Southern Colorado Power Company		
Gross earnings	$2,265,150	$2,411,152
Net earnings	1,005,640	1,057,333
Other income	9,326	17,773
Net earnings including other income	1,014,966	1,075,106
Wisconsin Public Service Corporation		
Gross earnings	$4,831,556	$4,597,777
Net earnings	1,989,389	1,911,294
Other income	10,685	8,562
Net earnings including other income	2,000,074	1,919,856
Wisconsin Valley Electric Company		
Gross earnings	$1,658,385	$1,587,077
Net earnings	740,149	796,365
Other income	15,730	8,382
Net earnings including other income	755,879	804,747

American Water Works Reports Increased Earnings

Consolidated net income of the American Water Works & Electric Company, Inc., after all charges, including reserves for renewals, retirements and depletion, for the year ended Aug. 31, 1928, was $5,386,555. This is equivalent, after accrued first preferred dividends, to $2.92 a share on the 1,432,163 shares of common stock outstanding as of Aug. 31, 1928. For the year ended Aug. 31, 1927, net income after similar charges amounted to $5,206,493, which was $3.10 per share on the 1,361,411 shares of common stock which were then outstanding.

COMPARATIVE EARNINGS STATEMENT OF AMERICAN WATER WORKS

Month of August	1928	1927
Gross earnings	$4,148,266	$4,017,476
Operating expenses, maintenance and taxes	2,184,039	2,218,491
Gross income	$1,964,227	$1,798,984
Year Ended Aug. 31	**1928**	**1927**
Gross earnings	$50,134,315	$47,956,261
Operating expenses, maintenance and taxes	26,104,495	24,946,565
Gross income	$24,029,819	$23,009,696
Less:		
Interest and amortization of discount of subsidiaries	$8,229,556	$8,625,801
Preferred dividends of subsidiaries	5,057,498	4,466,348
Minority interests	42,325	48,829
	$13,329,380	$13,140,978
Balance	$10,700,439	$9,868,717
Interest and amortization of discount of American Water Works & Electric Company, Inc.	1,277,700	1,169,687
Balance	$9,422,739	$8,699,029
Reserved for renewals, retirements and depletion	4,036,184	3,492,536
Net income	$5,386,554	$5,206,493

Power output of the electric subsidiaries of the American Water Works & Electric Company, Inc., for the month of August, 1928, totaled 148,539,568 kw.-hr., comparing with 136,513,123 kw.-hr. in August, 1927. For the first eight months of 1928 power output totaled 1,150,992,795 kw.-hr., against an output of 1,096,346 kw.-hr. in the corresponding period 1927.

"Chade" Sells Portion of American Shares

A stock offering of American shares has just been made by the Compañia Hispano-Americana de Electricida, S. A., otherwise known as "Chade," representing deposited shares, series E. These new shares are exchangeable after Jan. 6, 1929, for series E shares.

This offering is part of 20,000 American shares which constitute a portion of the company's 600,000 shares authorized in June, 1928, of which 400,000 shares were offered to existing shareholders at par and 180,000 were offered in Europe.

"Chade" was incorporated in June, 1920, in Madrid to take over various enterprises in South America owned by German interests. These properties had been operating in the utility field in Buenos Aires and elsewhere since 1901. The company owns and operates about 83 per cent of the electric light and power properties serving Buenos Aires and Avellaneda, and through subsidiaries owns and operates electric light, gas and tramway properties in the environs. It has also important investments in various European utility and management companies.

Puget Sound Power Directors Sanction Merger with Engineers

A FURTHER step in the proposed consolidation of the Puget Sound Power & Light Company with the Engineers Public Service Company was taken last week when the directors of the former voted to recommend to the stockholders that they accept the offer.

Under the proposed plan of exchange the holders of Puget Sound Power & Light common will receive, for each share they deposit before Nov. 17, 1¼ shares of Engineers Public Service common and ½ share of Engineers $5.50 dividend preferred, each full share of which carries a warrant, exercisable between Nov. 1, 1929, and Nov. 1, 1938, for the purchase of one share of Engineers common at $68. As a large amount of the Puget Sound common stock has already assented to the exchange it is expected that the plan will be consummated. In connection with the foregoing offer and for other corporate purposes the Engineers Public Service Company has sold to a banking group headed by Stone & Webster and Blodget, Inc., for offering in the near future 130,000 shares of the newly created $5.50 preferred stock with warrants.

The figures in the following table show the stock quotations since 1923:

PRICE RANGE OF PUGET SOUND COMMON STOCK

1923	1924	1925	1926	1927	1928
43½–56	43½–61¼	49–61	26–66½	28–38¾	34⅛–107¾

The earnings per share on this stock during the five-year period from 1923 to 1927, inclusive, are given in the following table:

EARNINGS PER SHARE SINCE 1923

1923	1924	1925	1926	1927
7.21*	4.43	4.49	2.11	3.06

*Based on $100 par value.

In the opinion of Charles W. Kellogg, president of Engineers Public Service Company, the acquisition should be of value to the customers and stockholders of the Puget Sound Company in strengthening its credit position and should prove beneficial to stockholders of the Engineers company in still further diversifying the territory served by its subsidiaries. "The addition of the Puget Sound Company to the Engineers group," Mr. Kellogg said recently, "will increase the annual consolidated gross earnings by about $15,000,000, or 50 per cent, besides adding to the areas now served in eleven states an area in the Pacific Northwest about as large as New England exclusive of Maine. The Puget Sound company serves 508 communities and has more than 125,000 customers; more than 60 per cent of all the farms in the territory use the company's service. More than three-quarters of its earnings are from the light and power department and this, together with the fact that more than four-fifths of the generating equipment is hydro-electric, makes the company a desirable acquisition."

It was pointed out by Mr. Kellogg that the Charles A. Coffin award was recently given to the Puget Sound Power & Light Company in recognition of its distinguished contribution during 1927 to the development of electric light and power for the convenience of the public and the benefit of the industry. The exhibits in connection with this award included the interesting statements that stock ownership in the territory served totals $16,000,000 and that the energy consumed per resident customer averaged 763 kw.-hr. in 1927, compared to 350 in the average well-managed Eastern company.

Earnings statements of the two companies for the past two years follow:

ENGINEERS' PUBLIC SERVICE
(Twelve Months Ended April 30)

	1928	1927
Gross earnings	$30,098,975	$27,689,528
Operating costs	18,312,060	17,196,536
Net earnings	$11,786,915	$10,492,992

PUGET SOUND POWER & LIGHT COMPANY
(Year Ended Dec. 31)

	1927	1926
Gross earnings	$14,925,482	$13,533,747
Operating costs, etc.	8,564,667	7,814,498
Net earnings	$6,360,815	$5,719,249

At the end of 1927 the Puget Sound company had total assets of $122,273,888 and assets of the Engineers Public Service system at a recent date were $177,393,360, making a total of approximately $300,000,000.

PACKARD ELECTRIC DECLARES EXTRA DIVIDEND—Directors of the Packard Electric Company have declared an extra dividend of 50 cents per share in addition to a regular quarterly dividend of $1 per share on the outstanding 30,600 shares of common stock (no par value), both payable Oct. 15 to holders of record Sept. 29. On Jan. 15, April 15 and July 15 last an extra dividend of 30 cents per share was paid, in addition to a regular quarterly disbursement of 70 cents per share.

Business News and Market Conditions

Electrical Exports Gain 8.9 per Cent

A gain of 8.9 per cent is indicated in statistics for exports of electrical equipment for the first eight months of the year. The total this year was $71,907,905. The August total is almost 3 per cent over that for July and is 5.5 per cent greater than the total for August last year.

Among the markets for these products Canada is still by far the most important, taking 23.3 per cent of the total to all countries for August. Australia and New Zealand are assuming a more important position as importers of electrical goods and equipment. For August they took almost 8 per cent of the total to all countries.

Among the items showing the largest gains for the eight months ended Aug. 31 radio equipment takes first place. Transmitting sets and parts increased over 150 per cent, to $472,350; receiving sets increased 35.4 per cent, to $2,028,215. Radio accessories also showed a very substantial gain.

Refrigeration sets exported during the period advanced from $2,498,020 to $4,194,844 and washing machines also gained substantially in totals exported to all countries.

Freight Loadings Heavier

August total of car loadings of miscellaneous freight were larger than for any previous August. This is due partly to earlier grain movements this year and also to an increase in ore loadings.

Value and Destination of Electrical Exports for August, 1928, Compared with Corresponding Month in 1927

(Issued by Bureau of Foreign and Domestic Commerce)

Article	August 1927	August 1928
Generators:		
Direct current—		
Under 500 kilowatts	$71,275	$88,405
500 kilowatts and over	49,589	28,712
Alternating current—		
Under 2,000 kva	13,020	27,442
2,000 kva. and over	.....	.....
Steam turbine generator sets	19,531	137,261
Accessories and parts for generators	112,358	58,860
Self-contained lighting outfits	148,314	74,930
Batteries:		
Flashlight batteries	172,750	193,682
Other dry and wet cell primary batteries	195,029	218,480
Storage batteries	306,815	213,418
Transforming or converting apparatus:		
Power transformers	152,673	.....
Power transformers 500 kva. and over	.....	50,513
Distribution transformers, less than 500 kva	.....	80,957
Other transformers	71,235	.....
Instrument transformers	.....	2,772
Other transformers, n.e.s.	.....	94,101
Battery chargers under 15 amperes	.....	24,007
Rectifiers, double current and motor generators, dynamotors, synchronous and other converters	253,074	114,270
Transmission and distribution apparatus:		
Switchboard panels, except telephone	118,461	127,250
Switches and circuit breakers over 10 amperes	145,697	153,196
Fuses and fuse blocks	28,689	37,935
Watt-hour and other measuring meters	47,652	81,823
Volt, watt, and ampere meters, and other recording, indicating, and testing apparatus	176,860	.....
Electrical indicating instruments	.....	52,198
Electrical recording instruments	.....	28,803
Other electrical testing apparatus	.....	72,949
Lightning arresters, choke coils, reactors, and other protective devices	77,972	66,616
Motors, starters, and controllers:		
Motors under 1 horsepower	$266,445	.....
Motors ¼ horsepower and under	.....	$167,562
Motors over ¼ and under 1 hp	.....	69,763
Stationary motors—		
1 to 200 horsepower	292,844	228,611
Over 200 horsepower	15,102	29,000
Railway motors	89,598	450
Electric locomotives—		
Railway	.....	20,000
Mining and industrial	11,203	22,876
Station and warehouse electric motor trucks	13,860	33,698
Starting and controlling equipment—		
For industrial motors	69,199	127,415
For electric railway and vehicle motors	6,711	10,269
Portable electric tools	75,972	117,201
Accessories and parts for motors	234,575	316,646
Electric appliances:		
Electric fans	86,102	85,808
Electric lamps—		
Metal filament	82,753	108,328
Other electric lamps	45,256	35,533
Flashlights	223,248	172,422
Searchlights and projectors	50,184	69,806
Motor-driven household devices	169,201	.....
Electric vacuum cleaners	.....	52,143
Other motor-driven devices, except tools	.....	40,308
Domestic heating and cooking devices	140,247	.....
Electric flatirons	.....	43,078
Electric cooking ranges	.....	18,489
Other domestic heating and cooking devices	.....	75,441
Industrial electric furnaces and ovens	75,124	29,213
Therapeutic apparatus, X-ray machines galvanic and faradic batteries, etc.	125,684	151,203
Signal and communication devices:		
Radio apparatus—		
Transmitting sets and parts	9,742	74,636
Receiving sets	183,402	350,994
Tubes	79,467	73,328
Receiving-set components	$202,010	$313,273
Receiving-set accessories	219,397	195,615
Telegraph apparatus	55,271	100,238
Telephone apparatus—		
Telephone instruments	29,773	51,493
Telephone switchboards	32,051	14,497
Other telephone equipment	276,304	188,484
Railway signals, switches and attachments	36,330	53,097
Bells, buzzers, annunciators and alarms	18,325	27,081
Other electric apparatus:		
Spark plugs, magnetos, and other ignition apparatus	138,238	.....
Spark plugs	.....	128,449
Other starting, lighting, and ignition equipment	.....	94,543
Insulating material	130,702	114,032
Metal conduit, outlet, and switch boxes	103,628	98,528
Sockets, receptacles, and lighting switches	150,997	155,561
Electric lighting fixtures, interior and street	187,190	.....
Electric interior lighting fixtures	.....	157,365
Electric street lighting fixtures	.....	48,408
Other wiring supplies and line material	102,027	101,148
Other electrical apparatus, n.e.s.	512,550	708,009
Rubber and friction tape	37,847	42,522
Globes and shades for lighting fixtures	42,655	64,656
Electrical glassware except for lighting	17,718	20,864
Electrical porcelain:		
For less than 6,600 volts	28,674	55,981
For 6,600 volts and over	35,084	64,098
Carbons, carbon brushes, and electrodes:		
Electrodes for electric furnaces	154,867	200,976
Other carbon products	111,639	60,830
Insulated wire and cable (iron or steel)	30,422	9,734
Copper bare wire	141,681	146,475
Copper, insulated wire and cable	431,382	412,125
Refrigeration sets up to 1 ton capacity	421,475	418,920
Domestic washing machines	112,288	123,526
Totals	$8,267,438	$8,723,329

DESTINATION OF ELECTRICAL EXPORTS

Country of Destination	Value August, 1928
EUROPE:	$1,553,709
Belgium	108,420
France	177,685
Germany	104,939
Italy	183,578
Netherlands	72,871
Spain	145,977
Sweden	56,058
United Kingdom	453,243
Other countries	250,938
WESTERN HEMISPHERE:	$5,136,304
Canada	2,538,320
Mexico	428,396
Cuba	298,750
Argentina	564,586
Brazil	358,990
Chile	179,817
Colombia	164,244
Peru	55,644
Venezuela	118,044
Other countries	429,513
ASIA, AFRICA AND OCEANIA:	$2,033,316
British India	239,983
China	121,644
Japan	345,243
Philippine Islands	123,398
Australia	568,751
New Zeland	105,333
Union of South Africa	179,551
Other countries	349,413

Market Conditions

UPWARD tendencies are evident in the volume of business transacted in the electrical equipment field in virtually all parts of the East. Small motors feature New England business and are prominent in that of the Eastern district, where construction work also is quite heavy. In the Southeast some substantial orders are recorded in high-tension switching equipment.

Improvement in the basic industries such as steel and the automobile industry is giving rise to a greater volume of sales in the electrical field in the Middle West. There are also some large orders in connection with new construction, including one for an addition to a distribution station, totaling $240,000. On the Pacific Coast business is exceedingly active both in general construction and in marine requirements. One of the latter orders totals $14,000,000. Radio orders also are larger than usual.

Metal Markets Inactive— No Change in Prices

The exceptional demand for lead and copper which has dominated the metal markets in recent weeks has subsided and business consummated during the week ended Wednesday is considerably less than average in volume. Copper is very quiet and a large proportion of the business done has been in relatively small lots.

NEW YORK METAL MARKET PRICES

	Oct. 3, 1928 Cents per Pound	Oct. 10, 1928 Cents per Pound
Copper, electrolytic	15.25	15.25
Lead, Am. S. & R. price	6.50	6.50
Antimony	11.375	11⅜
Nickel, ingot	35	35
Zinc, spot	6.60	6.25
Tin, Straits	49.50	48½
Aluminum, 99 per cent.	24.30	24.30

Base copper wire price Sept. 26, 1928, 17¼ cents.

Steady Increase in Business in Eastern District

Sales of electrical equipment continue to show upward tendencies in the Eastern district and under an excellent market tone both central-station and industrial accounts give encouraging indications for the early future. The demand for motors shows improvement; current commitments are at a good level and incoming inquiries are advancing. Automobile manufacturers are quite active and a sizable turn-over of motors and miscellaneous generating apparatus is ensuing. Chemical account is taking on a stronger attitude for immediate business, while cement mills are in the market for important requirements. Orders from steel and iron mills are not quite up to expectations, but improvement is anticipated. A manufacturer in the Middle West has secured a contract for electrical equipment and other machinery for cement mill service to cost $600,000. A metal-working company in New England has ordered transformers, generating apparatus and switching equipment at a cost of $80,000.

While central-station companies are limiting current buying almost to immediate needs, there is a marked betterment in the extent and volume of commitments as compared with a month or two ago. A manufacturer of transformers, circuit breakers and kindred equipment reports substantial transactions with several utility companies, while another maker says that trade in this line is fair. A central station in northern New York has contracted for transformers and substation apparatus to an amount of $80,000. A New England utility company has placed an order for similar equipment totaling $45,000. A manufacturer of Diesel engine units has secured a contract from the War Department for an electric power station of this type in Louisiana.

Meter sales are reaching better proportions. Inquiries are not only increasing in volume but in the size of individual commitment, with several metropolitan central stations now in the market. A New York utility company has placed an award with a local manufacturer for a quantity of direct-current meters to cost $60,000. Marine account is developing to higher levels and makers of turbine drives view the situation with favor. A Pennsylvania manufacturer has secured contracts for three new vessels, covering two geared turbine drives and a Diesel-electric installation. Bus equipment is growing to a sizable extent, with gas-electric equipment showing a tendency to lead. A New Jersey manufacturer of motor buses has given an order to a New York maker of the last noted equipment amounting to $25,000. Wire and cable business is holding uniform. Construction activities in the Eastern district include the following:

The General Petroleum Company of California, Inc., New York, plans a refinery at Torrance, Calif., to cost $2,000,000. The Lackawanna Railroad Company, New York, will build a storage warehouse and distributing plant at Jersey City, N. J., to cost $1,750,000. The Fox Brothers International Corporation, New York, has contracted with the Segura & Jugar Hydro-electric Development Company for the construction of five hydro-electric power plants on the Segura and Jugar Rivers, southeastern Spain, to cost $15,000,000. G. Elias & Brother, Buffalo, plan an aircraft manufacturing plant at Cheektowaga, N. Y., to cost $150,000. The Port of New York Authority, New York, plans a material and equipment testing laboratory at Jersey City, N. J., to cost $250,000. The Precision Die Casting Company, Syracuse, N. Y., plans a plant at Cleveland to cost $100,000. The New York Telephone Company, New York, has authorized an additional appropriation of $14,676,285 for expansion and betterments in substations and system. The Public Service Electric & Gas Corporation, Newark, N. J., plans a power substation on South Broad Street, to cost $65,000, and a meter station at Piscataway, N. J.

The Edgcomb Steel Company, Philadelphia, plans a storage and distributing plant to cost $150,000. Norristown, Pa., plans a municipal electric lighting plant. The American Sheet & Tin Plate Company, Pittsburgh, will make improvements at its mill at Vandergrift, Pa., to cost $2,000,000. The Atwater Kent Manufacturing Company, Philadelphia, plans an addition to cost $125,000. The Bureau of Yards and Docks, Navy Department, Washington, is asking bids until Oct. 31 for a fire alarm system at Yorktown, Va. (Specification 5379).

New England Sales Steady

A steady tone, marked by continued demand for small motors and switch and control equipment, was reported in the New England district. Small motors maintained a good level in sales volume and one order for a number amounting to $2,800 was noted. An order for a group of 50-hp. motors was recently placed for pumping purposes. A manufacturer records sales amounting to $13,000. Fractional-horsepower motor sales are keeping up well. Central-station supplies are moving fairly well and recently a number of orders for additional equipment for substation construction were reported. One consisted of inside control equipment amounting to $2,600 for a southern New England station. A number of orders for insulators were noted and tower equipment amounting to $3,000 was recently placed. Poles, wire and crossarms are active and deliveries are being rushed for the completion of work in the northern districts.

Electric heating equipment is active and orders for additional heat-treating units are being considered in good number. Negotiations for heavy equipment are growing in number and line material and power station equipment which will be required by two large stations now under construction are reported. Construction projects are as follows:

The Standard Oil Company, New York, plans a storage plant near North Weymouth, Mass., to cost $1,000,000. The McKesson & Robbins Company, Fairfield, Conn., plans an addition to its drug and chemical plant to cost $150,000.

Substantial Business Noted in Southeast

The largest order reported for the Southeast was for $30,000 worth of high-tension switching equipment ordered by an Alabama power company. One of the smaller power companies in Georgia and a newcomer in the territory ordered line construction and house wiring materials amounting to $15,000, while another company's distribution and small power transformer orders aggregated $5,550. Orders for heating appliances for Christmas stocks are coming through in good volume, one of the leading jobbers stating his orders are more than 20 per cent in excess of the same period last year. A power company in the Carolinas ordered $23,000 worth of socket appliances for the holiday trade and a power company in Georgia has just completed a campaign in which electric refrigerator

equipment in excess of $200,000 was sold. Radio is going briskly and considerable difficulty is being experienced in supplying the demand.

Contracts have been let on an addition to a Georgia milling plant and transformer and motor equipment and wiring supplies totaling $7,000 will be required for the job. A steel plant in Georgia and a textile mill in the Carolinas each placed orders for motor equipment costing $5,000. Contracts are to be let on an automobile accessory manufacturing plant to be built in Tennesee and the electrical materials aggregating $50,000 will be ordered. An electrification contract on a Georgia brick plant is also expected to be let and electrical equipment amounting to $9,100 will be used in the work. A town in South Carolina ordered white-way equipment costing $4,000. Construction projects are as follows:

The Virginia Public Service Company, Charlottesville, Va., plans a transmission line to Mineral, Va. The Kentucky Utilities Company, Louisville, Ky., plans a transmission line to Horse Cave, Ky., about 15 miles, and will build a power substation to cost $40,000. Middlesboro, Ky., plans a municipal light and power plant. The Cleveland-Tennessee Enamel Company, Cleveland, Tenn., plans a plant to cost $100,000. The Mississippi Power Company, Gulfport, Miss., plans construction of transmission line from Winborn to Hickory Flat, Ky. The Alabama Braid Corporation, Gadsden, Ala., plans a power plant at the proposed local textile mill to cost $100,000. Palmetto, Fla., will receive bids until Oct. 22 for a Diesel oil-engine direct-connected to electric alternator, with switchboard and auxiliary equipment. The Florida Power Corporation, St. Petersburg, Fla., plans a transmission line to Brooksville, Fla. The Tampa Electric Company, Tampa, Fla., plans a power substation.

Sales Volume Reduced in St. Louis

The only contract worthy of mention reported in the St. Louis district is an order for a lot of distribution transformers costing $18,000 to go to a power company in the western part of this district. The opinions on electrical conditions are divergent, part of the manufacturers reporting that the demand is holding steady, while others consider it little sluggish. Sales of construction materials are still slightly below the normal volume. Construction projects are as follows:

The Sheffield Steel Company, Kansas City, Mo., plans a power plant to cost $25,000. The Standard Steel Works, North Kansas City, Mo., plans a storage and distributing plant to cost $70,000. Poplar Bluff, Mo., plans an ornamental lighting system. C. H. Walbert, Oklahoma City, Okla., and associates plan an ice-manufacturing plant at Tulsa, Okla., to cost $115,000. The Public Service Company of Oklahoma, Tulsa, Okla., plans extensions in transmission lines in vicinity of McAlester and Bartlesville, Okla. The Gulf States Utilities Company, Beaumont, Tex., plans a transmission line to Conroe, Tex., including a power substation.

The Central Power & Light Company, San Antonio, Tex., will build a cold storage plant at Brownsville, Tex., to cost $40,000. Brownsville, Tex., plans a floodlighting system to cost $18,000. Denton, Tex., plans extensions in its municipal power plant and ice-manufacturing plant to cost $30,000. The Houston Oil Company, Houston, Tex., plans a storage and distribution plant at Camden, Ark., to cost $100,000. The Houston Lighting & Power Company, Houston, Tex., plans an equipment storage and distributing plant to cost $250,000.

Business Gradually Increasing in Middle West

The volume of business in the Middle West is increasing gradually, with slight acceleration apparent as the fall season gets under way. The reports emanating from the steel industry are very encouraging, while the automotive industry continues to prosper. Reports of car loadings indicate a volume movement of commodities and preliminary agricultural reports point to a favorable condition in the farming districts. The utility companies are busy with a considerable amount of construction work and some purchasing of apparatus is going on. Interesting orders placed include a construction order for an addition to a distribution station valued at $240,000, twelve 3,000-amp. and twelve 1,350-amp., 125-ohm, 60-cycle indoor type current-limiting reactors, three 833-kva. OIWC 12,000-volt, single-phase, 60-cycle transformers, three 154-kva., 600-amp. S.P.S.T. wheel-mounted oil circuit breakers and one turbine-driven and two motor-driven boiler feed pumps complete with appurtenances. The increased building activity, together with municipal and railroad business, has helped jobbers' sales considerably. Construction projects are as follows:

The University of Wisconsin, Madison, Wis., plans an electrical laboratory to cost $100,000. The Aluminum Goods Manufacturing Company, Manitowoc, Wis., plans an addition to cost $200,000. The Seaman Body Corporation, Milwaukee, plans an addition to its power plant to cost $30,000. Spooner, Wis., plans extensions to its municipal electric light plant and water station to cost $90,000. The Federal Motor Truck Company, Detroit, plans an addition to cost $150,000. The Clayton & Lambert Manufacturing Company, Detroit, will build an addition to its metal stamping plant, to cost $750,000. The Steel & Tubes, Inc., Cleveland, will build a power plant at the proposed mill at Ferndale, Mich., to cost $40,000.

The Houghton County Electric Light Company, Houghton, Mich., plans extensions in transmission lines in Portage, Mich. The University of Chicago, Chicago, will soon take bids on the superstructure of a central power plant to cost $1,000,000. The Standard Oil Company, Chicago, plans a storage and distributing plant at Decatur, Ill., to cost $100,000. The Chrysler Motor Corporation, Detroit, plans a factory and distributing plant at Chicago, to cost $100,000. The Parks Aircraft, Inc., care of the Gardner Motor Car Company, St. Louis, plans an airplane manufacturing plant at East St. Louis, Ill., to cost $150,000. The Lakeside Railway Signal Company, Freeport, Ill., plans a plant at South Beloit, Ill., to cost $100,000. The Rockford Daily Republic, Rockford, Ill., plans a newspaper printing and publishing plant, to cost $450,000. The Link Belt Company, Indianapolis, Ind., plans an addition to its conveying machinery plant, to cost $150,000. The General Tire & Rubber Company, Akron, Ohio, plans an expansion program, including new buildings, to cost $1,000,000. The Mullins Body Company, Salem, Ohio, plans an expansion at its automobile body plant to cost $200,000. The Otter Tail Power Company, Fergus Falls, Minn., plans an improved lighting system at Devils Lake, N. D., and a transmission line to Mantador, N. D. R. S. Clark, Aberdeen, S. D., and associates plan a light and power system at Britton, S. D. Mankata and St. Charles, Minn., plan ornamental lighting systems. The Peoples Sugar Company, Moroni, Utah, plans a beet sugar mill at Cozad, Neb., to cost $500,000. The J. I. Case Threshing Machine Company, Des Moines, Iowa, plans an addition to cost $90,000.

Much Construction Planned on Pacific Coast

An exceptionally large prospective business from all sources is reported on the Pacific Coast, including such orders as two new Dollar Line electrically driven ships totaling $14,000,000, for which Pacific Coast yards are bidding; a $1,400,000 Long Beach auditorium, a $1,000,000 University of California museum and auditorium, a 250-bed private sanitarium in Los Angeles valued at $1,500,000, a $1,250,000 Fairfax Country Club hotel and an Imperial Valley hydro-electric plant utilizing irrigation canal system on which a $1,750,000 bond issue is being sold. Street-lighting business includes a $121,600 award by the city of Torrance for 286 single posts, 60 double and 83 combination; an order for 103 units for Berkeley, a prospective system for Oroville and a 46-standard addition for Alameda. Machinery orders include a $3,500 switchboard for a Hawaiian sugar plantation, a $1,500 order for 100 fractional-horsepower motors and a 500-hp. hoist motor and accessories valued at $7,000 for a gold mining company.

More than 100 carloads of one radio make alone have been sold along the Pacific Coast in the past four months, approximately half going to southern California. A battery manufacturer reports no diminution of volume of A, B and C sales, contrary to its expectation. Other recent radio developments have been two R.C.A. list drops at the very outset of the season and the launching of the Graybar receiving set campaign. The Los Angeles General Hospital will require nearly twenty carloads of rigid iron conduit. An electrical contract awarded to F. E. Newberry Company totaled $650,000 for wiring, signals, lighting, etc., without including such special features as the telautograph installation.

In face of a firm market which has definitely fixed recent advances in lumber prices, mills of the Pacific northwest are expected to begin buying more freely for replacement and additions. The movement of motors from 100 hp. down showed some pick-up and this change is expected to be further augmented until December. The largest order reported was for 50 motors, from 100 hp. down, for a Pierce County plant, totaling 1,200 hp., and there were a considerable number of small orders placed. Other sales include twelve

pumping outfits with motors from 40 to 5 hp. and eighteen 15-kv. outdoor type circuit breakers, costing $10,000, for the city of Tacoma. The Puget Sound Power & Light Company will construct the first five-million-dollar unit of what ultimately will be a twenty-five-million-dollar steam power plant at Benton, near Seattle, the initial operation to develop 35,000 kw. and the ultimate 210,000 kw. The city of Seattle on Oct. 5 awarded two street-lighting contracts totaling $275,000 and the town of Morton will open bids on Oct. 15 for labor and materials involved in the construction of a transmission line from the city of Tacoma's generating station near Alder to Morton, also for a transformer station and distribution system in Morton. A quarter-million-dollar bottle glass manufacturing plant and a four-hundred-thousand-dollar frog and switch plant are planned for Seattle. The Western Paper Converting Company, Salem, Ore., plans doubling the capacity of its plant. Construction projects are as follows:

The Emsco Aero Engine Company, Los Angeles, plans a plant at Southgate, Calif., to cost $200,000. The Fox Film Corporation, Los Angeles, will install electric power and other electrical equipment to cost $2,000,000 at the motion picture studios at Westwood, Calif., to cost $8,000,000. The Pacific Gas & Electric Company, San Francisco, plans a substation at Pittsburg, Calif., to cost $100,000. Santa Cruz, Fresno and San Leandro, Calif., plan ornamental lighting systems. The Wenatchee-Beebe Orchard Company, Clarkston, Wash., plans a cold storage and refrigerating plant to cost $75,000. The Federal Paper & Board Company, Portland, Ore., recently organized, plans a mill to cost $100,000. Salt Lake City, Utah, Tucson, Ariz., and the Colorado Central Power Company, Golden, Colo., plan ornamental lighting systems. The Chrysler Motor Corporation of Canada, Windsor, Ont., plans a plant near Walkerville, Ont., to cost $1,000,000.

Activities of the Trade

American Ironing Machine Company Is Reorganized

Announcement has just been made of the reorganization of the American Ironing Machine Company, which is the manufacturer of the "Super-simplex" ironing machine and has plants at Algonquin, Ill. This company manufactured the first home ironer, starting 23 years ago, and it also manufactures a line of laundry equipment for hotel and institutional use. The officers are: E. C. Peter, president; M. J. Broderick, vice-president and general manager; W. T. Peter, treasurer, and B. C. Getzelman, secretary.

THE ROSS HEATER & MANUFACTURING COMPANY, INC., Buffalo, N. Y., manufacturer of heat exchangers, condensers, feed water and hot water heaters, expansion joints, etc., announces the opening of a branch office in Philadelphia, at 121 North Broad Street. J. W. Spencer, Jr., formerly with the New York office, will be in charge.

SCHWEITZER & CONRAD, INC., 4421 Ravenswood Avenue, Chicago, manufacturer of high-voltage protective and switching equipment, announces the appointment of Arvid Wickstrom as its Duluth, Minn., correspondent. Mr. Wickstrom was formerly electrical engineer for M. A. Hanna & Company and for the General Electric Company.

THE TIMKEN ROLLER BEARING COMPANY, Canton, Ohio, announces the incorporation of a new company, known as the Timken Steel & Tube Company, which will take over the manufacture and selling of Timken steel and tubing. The headquarters and mills are in Canton, Ohio, with sales offices in Chicago, Los Angeles, Detroit and New York. The officers are: H. H. Timken, chairman; M. T. Lothrop, president; J. W. Spray, vice-president; A. J. Sanford, vice-president in charge of sales; J. E. Daily, vice-president in charge of operations, and J. F. Strough, secretary and treasurer.

RAINBOW LIGHT, INC., an operating subsidiary of Rainbow Luminous Products, Inc., 120 Broadway, New York, manufacturer of luminous tube-lighting apparatus, is opening two new production plants located in Pittsburgh and Boston. In addition to the two new plants, the capacity of the Detroit plant is being enlarged, as is also the main plant at Long Island City, N. Y.

THE FALK CORPORATION, Milwaukee, manufacturer of herringbone gears, speed reducers and flexible couplings, announces the appointment of B. W. Rogers, 225 Central Savings & Trust Building, Akron, Ohio, as its representative to cover Akron and environs.

THE PHILADELPHIA ELECTRICAL & MANUFACTURING COMPANY, 1228 North 31st Street, Philadelphia, is adding an additional 10,000 ft. to its factory. The space is to be used for the manufacture of "Pemco" electric water heaters.

THE IDEAL COMMUTATOR DRESSER COMPANY, Sycamore, Ill., announces the appointment of Albert E. Mace Company, Inc., 93 Heath Street, Boston, as its sales representative for the sale of Ideal commutator resurfacers and motor maintenance equipment in the New England territory.

THE BRINKERHOFF ELECTRIC COMPANY, 171 Franklin Street, New York, has plans under way for the construction of an incandescent lamp manufacturing plant, 70 ft. x 180 ft., at Eleventh Street and Shley Place, West New York, N. J.

Hygrade Lamp Company Buys Vosburgh Lamp Works

The Hygrade Lamp Company, Salem, Mass., has concluded arrangements for the purchase of the Vosburgh Miniature Lamp Company, Orange, N. J., manufacturer of small electric lamp units for automobile and other service. The purchasing company will consolidate with its organization and will remove the Orange works to its plant at Salem, where production will be concentrated and expanded.

THE WAGNER ELECTRIC CORPORATION, St. Louis, announces the appointment of R. W. Piper to its transformer sales division. Mr. Piper will travel the Wagner southeast district, including a section of West Virginia and the states of Virginia, North Carolina, South Carolina, Alabama and Florida. The company also announces that H. D. Epting has been transferred from its Philadelphia sales office to Atlanta.

THE LINCOLN ELECTRIC COMPANY, Cleveland, manufacturer of "Linc-Weld" motors and "Stable-Arc" welders, announces the opening of a San Francisco office at 533 Market Street in charge of W. S. Stewart. The company also announces that L. P. Henderson, formerly of the Chicago office, has been put in charge of the Minneapolis district. Robert Notvest has been transferred from Kansas City to Indianapolis, where he will have charge. R. E. Mason has been sent to Kansas City to replace Mr. Notvest and N. L. Nye has been stationed at Akron, Ohio, under the direction of R. P. Tarbell, manager of the Cleveland district.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has received orders for propelling equipment for three ships, including a 4,000-hp. geared turbine for a twin-screw passenger steamer which is to be a duplicate of the steamship *Waialeale*, placed in service last June by the Inter-Island Steam Navigation Company; a 750-hp. Diesel-electric drive for an all-steel ferryboat for the San Diego-Coronado Ferry Company, and a geared-turbine drive for a combination passenger and cargo vessel.

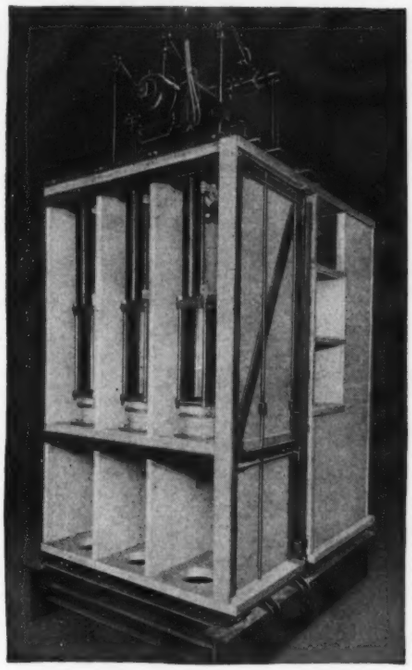
THE INGERSOLL-RAND COMPANY, 11 Broadway, New York, has received an order for three 300-hp. oil-electric locomotives which are being built jointly by the Ingersoll-Rand Company, the General Electric Company and the American Locomotive Company. These locomotives are being built for the Donner Steel Company of Buffalo.

THE WALTER A. ZELNICKER SUPPLY COMPANY, 511 Locust Street, St. Louis, manufacturer of railroad, mill and factory supplies and rails, announces that Spencer S. Swasey of Chicago has joined its organization as manager of the equipment department. Mr. Swasey was formerly with the George D. Whitcomb Company, Rochelle, Ill., for twelve years, during the last six of which he was in charge of sales.

New Equipment Available

Alberene Stone Adapted to Fabricated Switch Cells

Owing to certain unusual qualities claimed for Alberene stone, it has been adapted recently to the construction of switch cells and other electrical uses. Some of the qualities which make it particularly suitable for this purpose are its non-conducting and non-absorbent properties and its physical strength. The stone is also heat proof and is guaranteed against chipping or scaling. It is claimed that the stone can withstand the action of electric arcs better than almost any other material available for construction work.



Alberene stone applied to unit switch cell structure

The accompanying illustration shows the use of Alberene stone in a built-up switch cell structure using a General Electric type H breaker. This construction may be used in place of monolithic concrete or brick structures. Tongue-and-groove and mortised joints are used. The structure is prepared for erection without any fitting or cutting on the job, all such labor being done before shipment by the manufacturer.

The Alberene Stone Company is at present constructing five such switch structures for different concerns to be completed this year.

RUBBER CORD SETS WITH FLEXIBLE RUBBER CAP.—New rubber cord sets with a flexible rubber cap molded on one end, with the other end stripped ready for wiring, are announced by the Bryant Electric Company. These are produced in 10-, 20- and 30-ft. lengths and are adapted for use about the home, factory and farm.

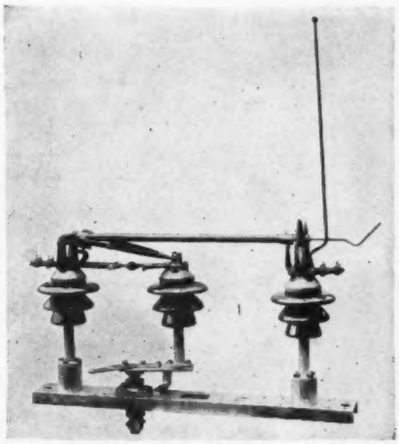
Frequency Meter

The General Electric Company has recently announced a completely new line of resonant-circuit type instruments in which full scale range may be as small as a single cycle. The new meters are of horizontal edgewise design, long found to be most satisfactory for this class of device, and are known as type H-8 frequency meters. The line includes five scale calibrations, the most sensitive having a full scale range between 59.5 and 60.5 cycles. Other calibrations are for 2, 5 and 10 cycles, arranged for service on 25-, 50-, and 60-cycle systems. All are intended for 110-volt operation.

In the design of these meters accuracy has been held of main importance. There are not appreciable voltage, wave form or temperature errors, even when operated under extreme conditions. The resonant circuit principle gives a deflecting torque which is proportional to the difference in the squares of the currents in two resonant circuits, and thus makes possible large deflections for very small changes in frequency. A further point of accuracy is obtained by the horizontal edgewise arrangement, in that parallax between needle and scale is eliminated, permitting extremely close readings regardless of the angle from which the meter is observed.

Improved Air-Break Switch

A new model of the type TTL-3 Hi-pressure contact air-break switch, produced by the Railway & Industrial Engineering Company, is illustrated herewith. The operating parts are

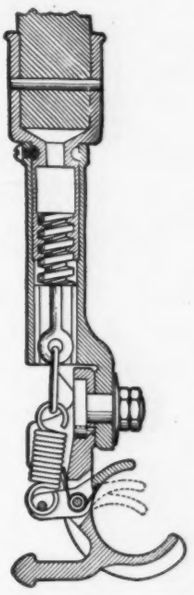


Type TTL-3 contact air-break switch

light in weight, of high tensile strength and made of non-ferrous materials. The one-piece jaw and terminal casting provides for the mounting of a grounding switch on wire guides. Terminal connections are made with ½-in. diameter bolts.

Matthews Wristogrip Puller

A quick and safe method of disconnecting and closing switch blades, or for removing and replacing fuse cartridges on open-type fuse and disconnecting switches of all types and makes is claimed for the No. 1375 Matthews Wristogrip puller. These operations can be quickly and easily performed by the operator while standing on the ground, or on a truck or platform; it makes unnecessary the climbing of poles to reach the switch.



Matthews Wristogrip puller, showing lower jaw grip

The Matthews Wristogrip puller is really an extension of one's hand and wrist. It is raised to the cartridge or blade with the hand-like gripping mechanism open; to close the "thumb," turn the pole to the right; when a secure grip is obtained, pull down on the pole. The wrist movement keeps the pole always at the same angle, but allows the gripping mechanism to turn with the downward movement of the cartridge or blade. Matthews Wristogrip puller is made of cast aluminum alloy, which combines strength and lightness.

DUAL PURPOSE AIRPORT LIGHT.—A new auxiliary landing field light which employs only a 2,000-watt lamp is announced by the B. B. T. Corporation, maker of the Fresnel lens. The light can be mounted on top of the regular type air mail lights or it can be used for temporary illumination prior to the requirements for installation of a major floodlighting system.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 25, 1928)

1,685,226. HEATING HIGH-TEMPERATURE APPARATUS; C. L. Burdick, New York, N. Y. App. filed June 25, 1926.

1,685,234. QUICK-MAKE-AND-BREAK ELECTRIC SWITCH; M. Katcher, New York, N. Y. App. filed Feb. 6, 1925.

1,685,266. PROCESS FOR HEATING LIQUIDS BY ELECTRICAL ENERGY FOR DISTILLATION, CONCENTRATION, PROVOCATION OF CHEMICAL REACTIONS, ETC. G. Baum, Karnten, Austria. App. filed Oct. 15, 1925.

1,685,329. ALARM MECHANISM; C. J. Lynch, San Francisco, Calif. App. filed Feb. 18, 1925.

1,685,361. CAP AND SHELL FASTENING; H. Hubbell, Jr., Bridgeport, Conn. App. filed May 7, 1927.

1,685,364. ELECTRIC WATER HEATER; E. T. P. Kopatz, Dearborn, Mich. App. filed Oct. 25, 1926.

1,685,369. INSULATED WIRE; E. A. Mau and O. F. Hutchinson, New Haven, Conn. App. filed Nov. 29, 1922.

1,685,382. METHOD OF BRIDGING THE CONNECTING WIRES OF ELECTRIC BLASTING CAPS; J. Stuart, 2d, Wilmington, Del. App. filed Feb. 9, 1927.

1,685,420. ELECTRIC-CABLE-COUPLING CONNECTER; J. Higham, Port Richmond, N. Y. App. filed Feb. 28, 1928.

1,685,431. TROLLEY-WIRE CLAMP; S. S. Matthes, Mansfield, Ohio. App. filed Sept. 7, 1927.

1,685,437. CONNECTER FOR SECTOR-SHAPED CONDUCTORS; A. B. Saurman, Pittsburgh, Pa. App. filed March 24, 1926.

1,685,440. SPEED-REGULATING MECHANISM; H. L. Tanner, Brooklyn, N. Y. App. filed Sept. 14, 1927.

1,685,462. SWITCH BOX; G. E. Palmer, Brookline, and E. G. Johansson, Boston, Mass. App. filed June 30, 1925.

1,685,464. MOTOR CONTROLLER; E. W. Seeger, Milwaukee, Wis. App. filed Nov. 30, 1925.

1,685,490. CASING FOR SAFETY SWITCHES; E. G. Johansson, Boston, Mass. App. filed May 14, 1926.

1,685,500. ELECTRIC SWITCH; G. J. Meuer, Milwaukee, Wis. App. filed Nov. 1, 1926.

1,685,514. SOCKET FLASHER; N. Abramson, Brooklyn, N. Y. App. filed March 6, 1926.

1,685,515. FLASHING PLUG; N. Abramson, Brooklyn, N. Y. App. filed Feb. 3, 1927.

1,685,549. SHORT CIRCUITER; E. P. Larsh, Dayton, Ohio. App. filed April 7, 1924.

1,685,563. CONDENSER MOUNTING; W. B. Connolly, Rochester, N. Y. App. filed Nov. 5, 1925.

1,685,608. ELECTRIC ATTACHMENT PLUG; G. Lipschutz, Philadelphia, Pa. App. filed May 28, 1927.

1,685,625. CABLE TERMINAL; D. Basch, Schenectady, N. Y. App. filed Jan. 31, 1928.

1,685,642. WATER HEATER; F. H. McCormick, Glen Ellyn, Ill. App. filed Dec. 13, 1926.

1,685,647. METHOD AND MEANS FOR REGULATING TEMPERATURE; J. L. Schroyer, Oak Park, Ill. App. filed July 2, 1924.

1,685,651. DYNAMO-ELECTRIC MACHINE; E. Testell, Paris, France. App. filed Sept. 21, 1926.

1,685,656. INDUCTION VOLTAGE REGULATOR; H. R. West, Pittsfield, Mass. App. filed May 25, 1927.

1,685,662. TERMINAL FOR BUSHING INSULATORS; A. O. Austin, Barberton, Ohio. App. filed Aug. 3, 1922.

1,685,663. INSULATED PERCH FOR PREVENTING BIRD TROUBLE IN CONNECTION WITH ELECTRICAL TRANSMISSION LINES; A. O. Austin, Barberton, Ohio. App. filed Aug. 11, 1924.

1,685,664. ELECTRIC SWITCH; K. Bauerschmidt, Karlshorst, Germany. App. filed April 7, 1925.

1,685,665. MECHANISM FOR OPERATING ELECTRIC SWITCHES; L. W. Bond, Schenectady, N. Y. App. filed Nov. 25, 1927.

1,685,667. RECORDING SYSTEM; G. F. Davis, Schenectady, N. Y. App. filed April 3, 1924.

1,685,669. HANGING MEANS FOR ELECTRIC FANS AND THE LIKE; F. C. De Reamer, Bridgeport, Conn. App. filed May 24, 1923.

1,685,671. AUTOMATIC MOTOR STARTER; L. C. Hardesty, Scotia, N. Y. App. filed Oct. 15, 1924.

1,685,674. BATTERY COMPOSITION; P. J. Kelleher, Salem, Mass. App. filed March 16, 1926.

1,685,677. INDUCTION MOTOR; H. Maxwell, Schenectady, N. Y. App. filed June 17, 1924.

1,685,684. INSULATOR SUPPORT; B. M. Smalley, Chicago, Ill. App. filed June 22, 1925.

1,685,695. SEPARATING DEVICE FOR LEAD STORAGE BATTERIES; C. J. V. Féry, Paris, France. App. filed May 18, 1926.

1,685,707. TOY MAGNETIC CRANE; E. J. Keedy, Schenectady, N. Y. App. filed Sept. 15, 1927.

1,685,714. RHEOSTAT; T. B. Moorer, Charleston, S. C. App. filed Sept. 16, 1924.

1,685,722. INSULATION OF CONDUCTORS USED IN ELECTRICAL APPARATUS; C. A. Parsons and J. Rosen, Newcastle-on-Tyne, England. App. filed March 19, 1925.

1,685,737, 1,685,738. DYNAMO-ELECTRIC MACHINE AND WINDING THEREFOR; G. M. Albrecht, Milwaukee, Wis. Apps. filed June 5 and July 6, 1926.

1,685,739. ROTOR FOR DYNAMO-ELECTRIC MACHINES; A. J. Brown, Milwaukee, Wis. App. filed July 18, 1921.

1,685,740. PRIME-MOVER, DYNAMO PLANT; R. H. Earle, Wauwatosa, Wis. App. filed June 18, 1924.

1,685,742. CORE FOR ELECTRICAL APPARATUS; E. C. George, Norwood, Ohio. App. filed Dec. 27, 1926.

1,685,746, 1,685,747. SYSTEM OF DISTRIBUTION; H. V. Nye, West Allis, Wis. Apps. filed Dec. 1 and March 3, 1924.

1,685,752. DYNAMO-ELECTRIC MACHINE AND WINDING THEREFOR; W. H. Powell, Wauwatosa, Wis. App. filed July 29, 1926.

1,685,767. ADAPTER FOR VACUUM TUBES; C. R. Phiffer, Schenectady, N. Y. App. filed July 23, 1926.

(Issued Oct. 2, 1928)

Reissue 17,093. THERMOELECTRIC HEATER; A. Torriani, Pavia, Italy. App. filed Nov. 27, 1925.

1,685,776. ELECTRIC SIGNALING APPARATUS; F. Favarger, Neuchatel, Switzerland. App. filed Oct. 31, 1924.

1,685,848. SIGNAL SYSTEM; G. A. Jackson, Waltham, Mass. App. filed March 8, 1924.

1,685,858. ELECTRIC SWITCH; A. H. Nero, New Britain, Conn. App. filed Oct. 17, 1923.

1,685,919. BOW TROLLEY FOR ELECTRIC VEHICLES; E. Kramer, Berlin, Germany. App. filed Nov. 7, 1925.

1,685,921. SELECTIVE CONTROL DEVICE; L. L. Ladd, Chicago, Ill. App. filed Nov. 8, 1920.

1,685,931. ACCELERATING RELAY; N. K. Andersen, Wilkinsburg, Pa. App. filed Nov. 10, 1922.

1,685,934. CIRCUIT BREAKER; A. H. Bakken, Pittsburgh, Pa. App. filed July 9, 1921.

1,685,935. MOTOR SNAP SWITCH; H. G. Baxter, Baldwin, N. Y. App. filed March 1, 1923.

1,685,936. FIELD DISCHARGE SWITCH; J. M. Brown, Pittsburgh, Pa. App. filed Jan. 23, 1920.

1,685,944. SYNCHRONOUS MOTOR STARTER; C. W. Drake, Irwin, Pa. App. filed June 17, 1920.

1,685,946. ELECTRICAL TRANSFORMER; A. G. Ellis, Hale, England. App. filed May 19, 1923.

1,685,948. SYSTEM OF CONTROL; A. B. Field, Marple, England. App. filed Jan. 30, 1923.

1,685,949. HIGH-SPEED CIRCUIT INTERRUPTER; C. Le G. Fortescue, Pittsburgh, Pa. App. filed Dec. 11, 1922.

1,685,950. CIRCUIT-INTERRUPTER SYSTEM; L. J. Hibbard, East Pittsburgh, Pa. App. filed June 10, 1922.

1,685,951. INSTRUMENT STRUCTURE; P. MacGahan, Orange, N. J. App. filed July 17, 1926.

1,685,958. THERMAL CUT-OUT; M. J. Sandin, Wilkinsburg, Pa. App. filed Jan. 23, 1923.

1,685,960. REGULATOR SYSTEM; F. Schiller, Berlin-Charlottenburg, Germany. App. filed Dec. 8, 1926.

1,685,961. FREQUENCY REGULATOR; B. H. Smith, Wilkinsburg, Pa. App. filed Jan. 31, 1921.

1,685,965. ALTERNATING CURRENT TRANSMISSION SYSTEM; M. W. Smith, Wilkinsburg, Pa. App. filed April 29, 1924.

1,685,965. MAGNETIC TESTING APPARATUS AND METHOD OF TESTING; T. Spooner, Edgewood Park, Pa. App. filed Sept. 27, 1922.

New Trade Literature

FURNACE AND OVEN INSULATION.—"The Insulation of Industrial Furnaces and Ovens" is the title of bulletin No. 108 issued by the Celite Products Company, 11 Broadway, New York City. The bulletin is thoroughly illustrated and contains drawings showing the method of insulating employed by practically every furnace designer in the country. Included in the drawings are electric and fuel-fired furnaces for heat-treating work of almost every description.

INDUCTION MOTORS.—Bulletin No. 103 issued by the Reliance Electric & Engineering Company, Ivanhoe Road, Cleveland, describes and illustrates its type AA fully inclosed fan-cooled Reliance induction motors with ball bearings for two-phase and three-phase alternating-current circuits.

GAS METERS.—The Bailey Meter Company, 1050 Ivanhoe Road, Cleveland, has issued bulletin No. 35, which describes the Bailey gas meters. It contains illustrations showing applications of the meters in various plants and line drawings showing the mechanism and parts of the instruments. Chart reproductions giving a record of operating conditions of a few installations are included.

CARBON CIRCUIT BREAKERS AND ADJUSTABLE INSERTS.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing leaflets L.20,371 and L.20,383 describing and illustrating its type CH carbon circuit breakers available in 2,000-, 4,000- and 8,000-amp. capacities for direct-current service at 750 to 1,500 volts, and its adjustable inserts for use in mounting machinery or other equipment to floors, walls or ceilings of concrete.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Purchase and agency are desired in Copenhagen, Denmark (No. 33,667), for manufacturing material for dry cell batteries and cables, wires, insulating material and electric motors.

Purchase and agency are desired in Lagos, Nigeria (No. 33,622), for batteries, lamps, bulbs, farm lighting sets and supplies.

An agency is desired in Leipzig, Germany (No. 33,571), for electrical hand dryers.

An agency is desired in Santos, Brazil (No. 33,617), for electrical supplies.

Purchase is desired in Johannesburg, South Africa (No. 33,629), of electrical hotel appliances.

Purchase and agency are desired in Harbin, China (No. 33,640), for household electrical appliances.

Purchase and agency are desired in Smyrna, Turkey (No. 33,668), for household electrical appliances and electrical lighting fixtures.

An agency is desired in Budapest, Hungary (No. 33,632), for motion-picture motor generator sets.

An agency is desired in Bordeaux, France (No. 33,666), for electrical refrigerators.

Purchase is desired in Copenhagen, Denmark (No. 33,669), of electrical refrigerators and vacuum cleaners.

An agency is desired in Cardiff, Wales (No. 33,573), for electrical household refrigerators.

An agency is desired in Vienna, Austria (No. 33,570), for electrical refrigerating units.